Doctoral programme Yielding Novel Advancements in Medicine and Innovative Solutions

Call 1

Research Lines:

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RL1. Beyond pressure overload: Treatment of the pressure-overloaded right ventricle by improving lung-heart cellular crosstalk

Key words: Translational research - Pulmonary hypertension - Right ventricle - Extracellular vesicles - Non-coding RNA - Omics.

Abstract: Right ventricular (RV) failure is the main determinant of prognosis in pulmonary hypertension (PH), yet no therapy specifically targets RV dysfunction. Current treatments aim to reduce pulmonary pressure but have limited impact on RV adaptation. Our group has uncovered that damage-derived signals from the pulmonary vasculature contribute directly to RV dysfunction, beyond pressure overload alone. This project offers a translational and integrative approach to uncover lung–heart crosstalk mechanisms that drive RV failure. Using a combination of histopathology, molecular biology, omics (genomics, proteomics, metabolomics), and advanced imaging in experimental models and patient cohorts, we dissect the cellular and molecular pathways involved in RV adaptation and maladaptation across PH etiologies. Our well-established porcine models of RV overload, together with access to patient data and biobanked samples, allow us to bridge bench-to-bedside findings. This line of research opens the door to personalized phenotyping and the development of targeted therapies to improve RV function and clinical outcomes in PH.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Ana García-Álvarez (ANAGARCI@CLINIC.CAT) Cardiomyopathies, heart failure and secondary pulmonary hypertension (Dr. García-Álvarez Group)	Dr. Ana Paula Dantas (adantas@recerca.clinic.cat) Atherosclerosis, coronary disease and heart failure (Dr. Sabaté Group)

About the co-supervision: This co-supervision group operates at the interface between clinical practice and laboratory research. It is co-led by a cardiologist and a translational scientist, ensuring a truly translational approach. The fellow will have access to advanced technologies, patient cohorts, and large-animal models, ensuring an enriching environment for scientific growth and personalized career development.

Examples of secondments opportunities: Amsterdam University Medical Center (The Netherlands, Europe), Mont Sinai Hospital (New York, US).

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RL2. Engineering Patient-Derived 3D Myeloma Models to Advance Personalized CAR-T Therapies and Unravel Microenvironment-Driven Resistance

Key words: Multiple myeloma - 3D disease modeling - CAR-T cell therapy - Tumor microenvironment - Extramedullary disease - Precision medicine.

Abstract: Multiple myeloma (MM) is a plasma cell malignancy that remains incurable despite the development of promising immunotherapies such as CAR-T cells targeting BCMA. However, most patients relapse due to antigen loss, limited persistence, or immune evasion within the bone marrow microenvironment. These challenges are especially relevant in extramedullary disease, a clinical manifestation lacking appropriate preclinical models. This research line aims to generate and apply advanced 3D in vitro models of MM and extramedullary disease to functionally evaluate CAR-T cell therapies. We will combine the clinical and translational expertise of Dr. Carlos Fernández de Larrea, who leads an academic CAR-T program for MM, with the pioneering work of Dr. Patricia Pérez-Galán in tumor modeling and microenvironment studies. Our joint strategy integrates patient-derived samples, 3D co-culture systems, and high-dimensional analyses to study CAR-T efficacy and resistance mechanisms in a personalized context. The ultimate goal is to create a robust preclinical platform to guide the design and testing of novel CAR-T strategies, particularly for extramedullary and relapsed disease. This work will provide unique opportunities for an early-stage researcher to engage in cutting-edge translational immunotherapy, bridging basic science and clinical application in the context of precision medicine.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Carlos Fernandez de Larrea (cfernan1@clinic.cat) Myeloma, amyloidosis, macroglobulinemia and other gammapathies (Dr. Fernandez de Larrea Group)	Dr. Patricia Pérez-Galán (PPEREZ@recerca.clinic.cat) Microenvironment in lymphoma pathogenesis and therapy (Dr. Pérez-Galán Group)

About the co-supervision: The candidate will be integrated into a highly collaborative, multidisciplinary environment, with access to cutting-edge technologies, clinical samples, and mentorship from experts in CAR-T therapy and tumor and microenvironment modeling. The fellow will participate in the institutional training program *"Stepping Stone"*, attend lab meetings from both research groups, be encouraged to participate in international conferences, and engage in secondments.

Examples of secondments opportunities: Dana-Farber Cancer Institute (Boston, US).

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RL3. Cognitive symptoms by defective synaptic plasticity in anti-NMDAR encephalitis

Key words: Working memory - Transcranial magnetic stimulation - Electroencephalography, Computational models - Serial dependence.

Abstract: We will test if defective adaptability of working memory (WM) maintenance to stimulus statistics underlies cognitive deficits in anti-NMDAR encephalitis, and if this is linked to impaired cortical plasticity. We have demonstrated defective serial dependence in patients during WM tasks (Stein et al. Nature Communications 2020). Computational models showed that altered serial dependence could be due to defective synaptic short-term potentiation (STP) in an attractor network. We hypothesise that patients have defective prefrontal cortical plasticity, causing a reduction in the adaptability of their WM to the changing statistics of the environment. To test this hypothesis we will:

1. Demonstrate impaired adaptation to stimulus statistics in patients and its relation to stimulus-evoked plasticity. We will test a group of anti-NMDAR encephalitis patients and matched healthy individuals in a WM task with non-uniform stimulus prior. We expect to see attraction of responses to the stimulus prior correlating with serial dependence and EEG signals, in healthy participants but not patients.
2. Measure STP in prefrontal networks using TMS and relate it to WM adaptability deficits in the participants. We expect to see TMS-evoked plasticity of prefrontal evoked potentials reduced in patients and correlate with attraction to the prior and with neuropsychology scores in patients.

Results will be integrated in a computational model to support our interpretations.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Albert Compte (acompte@recerca.clinic.cat)	Dr. Josep Dalmau (jdalmau@clinic.cat)
Theoretical neurobiology of cortical circuits (Dr. Compte Group)	Pathogenesis of autoimmune neuronal disorders (Dr. Dalmau Group)

About the co-supervision: The Brain Circuits and Behavior Lab gathers researchers in computational systems neuroscience, focusing on the neural mechanisms of rodent, monkey and human cognition. The Neuroimmunology group is a reference group in the study of autoimmune encephalitis in the world, both in animal models and patients. Our interdisciplinary team offers a stimulating environment, state-of-the-art facilities, and access to advanced methodologies. Regular mentorship, career workshops, and national/international collaborations will be provided. With a proven track record in nurturing early-career scientists, we ensure the researcher gains both technical expertise and transferable skills, fostering independence and innovation in computational cognitive neuropsychiatry.

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Examples of secondments opportunities: Vanderbilt University (Nashville, USA), University of Lausanne (Switzerland, Europe).

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RL4. Sleep, psychological and mental health factors in neurodegenerative disorders

Key words: Sleep - Mental health - Psychological factors - Neurodegenerative disorders - Biomarkers.

Abstract: Mental health factors, including neuropsychiatric symptoms and sleep disturbances, are increasingly recognized as potential determinants of neurodegeneration. The co-supervisor's group (Falgàs et al. Alzheimer's & Dementia 2024) demonstrated that neuropsychiatric symptoms are related to degeneration of a noradrenergic brain nuclei (locus ceruleus) in Alzheimer's disease. A recent international study lead by the supervisor's group (Bartrés-Faz et al. Nature Mental Health, 2025) showed that healthy older adults with lower sense of purpose in life had accelerated brain atrophy and cognitive decline over time. However, whether poor mental health status contributes directly to neurodegeneration or its effects are explained by a continuous engagement in non-favourable lifestyles, such as poor sleep quality, is not currently understood. Determining the specific associations between general mental health status, specific sleep difficulties and early biomarkers of neurodegeneration is of relevance for primary preventive dementia strategies. The translational collaborative line of research where the PhD project will be embedded aims to investigate the associations between basic biomarkers of neurodegeneration (specific Alzheimer's disease physio pathological markers, markers of brain integrity and connectivity) with the expression of mental health and behavioural lifestyle monitoring, focusing on sleep disturbances.

Co-supervisors

Basic/Translational	**Clinical**
Dr. David Bartrés-Faz (dbartres@ub.edu) Neuropsychology and neuroimaging (Dr. Bartrés-Faz Group)	Dr. Neus Falgàs (nfalgas@clinic.cat) Alzheimer's disease and other cognitive disorders (Dr. Sanchez-Valle Group)

About the co-supervision: Research in dementia diagnosis and care has focused on the identification of early modifiable factors. Dr. Falgàs's group has expertise in the clinical characterization of neurodegenerative disorders. Recent evidence indicates that lifestyles, psychological factors and refined measures of brain integrity may represent early markers of disease risk. Joining efforts with Dr. Bartrés-Faz, a world-renowned researcher in this area, represents a unique opportunity to develop cutting-edge translational research in the identification of early behavioural and mental health markers for neurodegeneration.

Examples of secondments opportunities: University of Oslo (Norway, Europe), INSERM (Caen, France, Europe), Maastricht University School for Mental Health and Neuroscience (The Netherlands, Europe), Fraunhofer Institute for Algorithms and Scientific Computing Scai

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(Sankt Augustin, Germany, Europe), Harvard Medical School (Boston, US), Tel Aviv University (Israel).

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RL5. GLP-1R Agonists in Maternal Metabolic Regulation and Early-Life Programming of Diabetes Risk

Key words: Maternal Programming - Pregnancy - Central nervous system - Type 2 diabetes - Obesity - Incretin-based therapies.

Abstract: This research line investigates how maternal eating habits, including obesogenic diets and altered feeding behaviors during pregnancy, rewire neuronal circuits and program long-term metabolic outcomes, thereby influencing susceptibility to obesity and type 2 diabetes. The program will integrate preclinical and translational approaches to explore how incretin-based therapies, particularly GLP-1 receptor agonists, shape the development distribution, and function of central and peripheral metabolic circuits. To this end, it will employ advanced methodologies, such as 3D brain imaging, single-nucleus RNA-Sequencing, fiber photometry, and chemogenetics, with a specific focus on pregnancy and offspring outcomes. The researcher will receive comprehensive training in experimental neurobiology, metabolic phenotyping, and translational endocrinology, working in close collaboration with the groups of Dr. Haddad and Dr. Vidal. This synergetic environment will provide a unique platform to explore fundamental mechanisms with direct clinical relevance. By elucidating these processes, the project aims to uncover novel insights into the neurobiology of energy homeostasis, fostering the development of innovative strategies to reduce the burden of obesity and diabetes.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Roberta Haddad Tovolli (haddad@recerca.clinic.cat) Neuronal control of metabolism (NeuCoMe) (Dr. Claret Group)	Dr. Josep Vidal (jovidal@clinic.cat) Translational research in diabetes, lipids and obesity (Dr. Vidal Group)

About the co-supervision: Our groups are strongly committed to supporting the fellow's scientific and career growth. Dr. Haddad will provide advanced training in neurobiology, maternal programming, and metabolism, while Dr. Vidal will add expertise in endocrinology, obesity, and diabetes. The candidate will gain proficiency in advanced methods such as 3D brain imaging, snRNA-seq, and neuronal manipulation. Through unique translational co-supervision, IDIBAPS doctoral training, and mentoring in publications, conferences, and grant writing, the fellow will develop independence and a strong translational and competitive scientific profile.

Examples of secondments opportunities: Paris Brain Institute, INSERM Lille, IGF Lyon (France, Europe); Gulbenkian Institute for Molecular Medicine (GIMM) (Portugal, Europe); Max Planck Institute for Metabolism Research (Germany, Europe).

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RL6.TRANSlating high-dimensional genomic profiling into clinical prediction in Pediatric Non-Hodgkin Lymphoma (TransNHLation)

Key words: Pediatric lymphoma - Non-Hodgkin Lymphoma - Genetics - Cytogenetics - Genomic profiling.

Abstract: Genetic and molecular profiling of different subtypes of Non-Hodgkin Lymphomas (NHL) in pediatric and young adult population through the application of high-resolution techniques for the identification of specific genetic alterations and target genes/pathways that may be useful as biomarkers in the management of these patients.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Itziar Salaverria (isalaver@recerca.clinic.cat)	Dr. Olga Balagué (obalague@clinic.cat)
Molecular genetics of pediatric lymphomas (Dr. Salaverria Group)	Molecular pathology of lymphoid neoplasms (Dr. Campo Group)

About the co-supervision: The fellow will be integrated in the Molecular Genetics of Pediatric Lymphomas group, which is part of the Lymphoid Neoplasms Program at the FRCB-IDIBAPS. The fellow will learn a portfolio genetic and molecular genetic techniques and bioinformatic skills applied to the study of pediatric B-cell lymphomas and benign conditions mimicking malignancy.

Examples of secondments opportunities: Tübingen University, Kiel University (Germany, Europe), National Cancer Institute/Center for Cancer Research (Bethesda MD, US).

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RL7.Translational research to combat aortopathies from genetic diseases of the connective tissue: Marfan and Williams-Beuren syndromes

Key words: Aortic aneurysm - Aortic stenosis - Extracellular matrix - TGF-beta - Oxidative stress.

Abstract: We have provided insights in the redox stress contribution to the development and progression of opposed aortopathies occurring in Marfan syndrome (MFS) and Williams-Beuren syndrome, which respectively lead to aortic aneurysm and stenosis. We reported the involvement of NADPH oxidase 4 (NOX4) and xanthine oxidoreductase (XOR). We reported that allopurinol, a specific inhibitor of XOR and usually administered to patients to treat gout, strongly prevented the progression of the aneurysm in a mouse model of MFS. In comparison with current pharmacological approaches to human patients, the advantages to administrate allopurinol are greater than losartan because it is safer, more economic and could be administered during pregnancy. These advantages have been recognized by the European Medicines Agency (EMA) and allopurinol has been approved as an orphan drug for treatment of MFS. This has opened the door to exploring a European multinational clinical trial in the context of VASCERN clinical groups. In our lab, we are also comparatively assaying the combinatory use of losartan, allopurinol and other antioxidants to interfere in the progression not only of the aneurysm in MFS but also in the aortic stenosis and hypertension that happens in WBS. Dr. Victoria Campuzano, a R3 member of the group, has generated a mouse model of the disease (CD), and preliminary results indicate that allopurinol also reverts characteristic hypertension and cardiovascular injuries of this disease.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Gustavo Egea (gegea@ub.edu)	Dr. Aleksandra Mas-Stachurska (amas-sta@clinic.cat)
Vascular Cell Biology (Dr. Egea Group)	Cardiac Imaging (Dr. Sitges Group)

About the co-supervision: The Vascular Cell Biology lab has extensive experience training postdoctoral researchers, Ph.D. and Master students (both national and from abroad) and technicians. We usually use imaging, biochemical and molecular techniques to address the basic research projects with the clear aim of translating our findings into clinical practice. In this respect, the participation of the expertise imaging clinician Dr. Mas-Stachurska provides a clinical perspective to our basic research not only theoretically but also experimentally with our mouse models. The Ph.D. student will actively participate in the experiments carried out in the vascular cell biology lab and at the same time will receive a clinical perspective actively participating in the weekly clinical seminars organized by the Cardiology department and hopefully accompanying Dr. Mas-Stachurska in her clinical assistance (workflow) to patients.

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Examples of secondments opportunities: University of Antwerp (Belgium, Europe), Academisch Medisch Centrum Amsterdam Hospital (The Netherlands, Europe).

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RL8. Phenoskin-Inferring Genotypes and Cancer Risk from 3D Skin Phenotypes Using Artificial Intelligence

Key words: Melanoma - Artificial intelligence (AI) - Multimodal - 3D imaging - Computer vision - Bioinformatics.

Abstract: Whole body 3D skin imaging has revolutionized cancer screening in dermatology by not only capturing all skin lesions but also their distribution across the body. It is known that specific skin lesion distribution patterns are associated with specific genetic variants and skin cancer risk. Current AI applications focus on assessing single skin lesions and do not confidently predict genetic alterations. Here, we will use multiple instance learning to predict genotypes and cancer risk looking at the overall skin captured by 3D imaging.

We have previously contributed to state-the-art artificial intelligence (AI) models for skin cancer diagnosis from dermatoscopy images. The DYNAMIS researcher will use our prospective study of > 1200 patients and >500 patients with paired genotype data to infer clinically relevant genotypes from whole body 3D skin imaging data. Specifically, the DYNAMIS researcher will augment multiple instance learning with coordinates using powerful pretrained computer vision models. They will then train, validate and test models for classification of genotypes and cancer risk by linking these models to time-to-event prediction with the possibility to integrate other relevant data sources (e.g. blood immune status). This will establish new artificial intelligence frameworks for previously understudied imaging types. Clinically, the project aims at targeting skin cancer surveillance to a large patient population who did not undergo genetic testing.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Susana Puig (spuig@clinic.cat) Melanoma: imaging, genetics and immunology (Dr. Puig Group)	Dr. Thomas Walle (academic@recerca.clinic.cat) Computational Cancer Biomedicine (Dr. Walle Group)

About the co-supervision: Our groups are strongly committed to co-mentoring the DYNAMIS researcher in both science and career development. We unite expertise in oncology, dermatology, genetics, and AI to provide a unique training environment. The researcher will leverage our unique data resources combining clinical and artificial intelligence research excellence. Thereby they will develop clinically deployable AI for skin cancer risk prediction. Embedded in an international academic network, they will receive tailored mentorship, interdisciplinary training, and support for long-term career growth.

Examples of secondments opportunities: Else Kröner Fresenius Center for Digital Health and Dresden University (Germany, Europe).

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RL9. Precision psychiatry in bipolar disorder: integrating neuroimaging, machine learning, and clinical research

Key words: Bipolar disorder - Neuroimaging - Machine learning - Biomarkers - Clinical research - Precision psychiatry.

Abstract: The project will focus on developing multimodal biomarkers to predict illness course, treatment response, and functional outcomes in bipolar disorder. By linking brain network alterations with cognitive and clinical features, the fellow will contribute to the development of tools for early detection, patient stratification, and personalized treatment. This research line will combine multimodal neuroimaging with advanced computational analysis and machine learning applied to large, clinically rich datasets.

To this end, the fellow will join two complementary groups at IDIBAPS: the translational Imaging of Mood and Anxiety-related Disorders (IMARD) group, internationally recognized for its expertise in neuroimaging and machine learning methods in mental health, and the Bipolar and Depressive Disorders group, a world leader in bipolar disorder research with unique patient cohorts. Both supervisors are Highly Cited Researchers and full professors at the University of Barcelona, highlighting the global impact of their work.

The training environment will promote independence, creativity, and international collaboration, preparing the fellow to become a future leader in precision psychiatry and to drive meaningful advances in the care of individuals with bipolar disorder.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Joaquim Radua (radua@recerca.clinic.cat) Imaging of mood- and anxiety-related disorders (IMARD) (Dr. Radua Group)	Dr. Eduard Vieta (evieta@clinic.cat) Bipolar and Depressive Disorders (Dr. Vieta Group)

About the co-supervision: IMARD is a translational group with expertise in neuroimaging, biomarkers, and computational methods applied to mental health. The Bipolar and Depressive Disorders group is a world-leading clinical team with exceptional patient cohorts, clinical trials, and translational studies. The fellow will receive close mentoring in neuroimaging, machine learning, and clinical psychiatry, and will be encouraged to lead innovative projects. They will be supported to build an independent profile through first-author publications, conference presentations, and leadership in subprojects, alongside strong backing for international collaborations and career development.

Examples of secondments opportunities: University of Copenhagen (Denmark, Europe).

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RL10. Neutrophils and Neutrophils Extracellular Traps (NETs) in Hepatocellular carcinoma: mechanisms and impact on immunotherapy

Key words: Hepatocellular carcinoma - Tumor immunology - Neutrophils and NETs - Immunotherapy - Interdisciplinary training - International collaboration.

Abstract: Hepatocellular carcinoma (HCC) is one of the leading causes of cancer-related death worldwide, with limited therapeutic options and suboptimal responses to immunotherapy. Increasing evidence highlights the crucial role of innate immune cells in shaping the tumor microenvironment and influencing therapy outcomes. Among these, neutrophils and their ability to release neutrophil extracellular traps (NETs) have emerged as key regulators of tumor growth, inflammation, and immune evasion. However, the precise mechanisms through which neutrophils and NETs contribute to HCC progression and modulate immunotherapy efficacy remain poorly understood. This research line focuses on dissecting the mechanistic roles of neutrophils and NETs in HCC, using robust experimental models that combine diethylnitrosamine injection with a Western diet to closely mimic human disease. By integrating immunophenotyping, molecular analyses, and functional assays, we aim to identify how neutrophil-driven pathways shape tumor–immune interactions and determine responsiveness to immune checkpoint inhibitors. Ultimately, this project seeks to generate actionable insights into the neutrophil/NET axis, paving the way for novel strategies to optimize immunotherapy in liver cancer. The PhD student joining this project will gain expertise in tumor immunology, in vivo HCC models, and translational cancer research, taking advantage of participating in contributing to a growing field with direct clinical relevance.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Montserrat Marí (monmari@clinic.cat)	Dr. Marco Sanduzzi-Zamparelli (msanduzzi@clinic.cat)
Hepatocellular signaling and cancer (Dr. Morales Group)	Hepatic oncology (BCLC) (Dr. Reig Group)

About the co-supervision: The PhD will be hosted by the Hepatocellular Signaling and Cancer group, experts in liver cancer mechanisms, signaling, immunology, and translational research. Co-supervision is provided by Dr. Marco Sanduzzi-Zamparelli, a Hepatocellular Carcinoma (HCC) and immune-oncology specialist from the Hepatic Oncology (BCLC) group. Through tailored mentorship, access to advanced liver cancer models, and integration in a vibrant European network, we ensure that PhD students acquire the skills, knowledge, and professional connections for a successful research career.

Examples of secondments opportunities: Maastricht University (The Netherlands, Europe), Münster University (Germany, Europe), INSERM (France, Europe).

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RL11. Unraveling human immune dysfunction in advanced mismatch-repair deficient colorectal cancer

Key words: Single cell genomics - Colorectal cancer - Artificial intelligence - Machine learning - Bioinformatics - Immunology.

Abstract: Immune checkpoint therapy (ICT) has transformed the treatment of mismatch repair deficient (dMMR) colorectal cancer (CRC). While primary dMMR CRCs show near-universal complete response rates, this efficacy drops to below 10% once tumors metastasize. The biological basis for this dramatic loss of therapeutic benefit is unknown.

This project will define the immune determinants of ICT response across primary and metastatic dMMR CRC. The DYNAMIS fellow will focus on data analysis with opportunities for method development and wetlab data generation. They will compare longitudinal single cell RNA-sequencing (scRNA-seq) data from blood with paired tumor tissue spatial transcriptomics data to distinguish local from systemic immune responses. Comparing primary and metastatic CRC the candidate will identify gene expression programs which differ between primary and metastatic CRC and which define clinical responses. By developing new frameworks for time-course modeling of scRNA-seq data, they can track immune gene expression programs as they evolve during therapy, identifying when and how responses diverge between primary and metastatic disease. In parallel, they will investigate the contribution of patient genetic variation to heterogeneity in immune program execution, providing insights into why some patients maintain durable responses while others relapse. Together, this approach will reveal the mechanisms driving lack of ICT efficacy during metastatic progression.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Francesc Balaguer Prunés (fprunes@clinic.cat)	Dr. Thomas Walle (academic@recerca.clinic.cat)
Gastrointestinal and pancreatic oncology (Dr. Castells Group)	Computational Cancer Biomedicine (Dr. Walle Group)

About the co-supervision: Identifying cellular processes involved in immune dysfunction in humans requires cross-disciplinary expertise across GI-oncology, immunology and bioinformatics. This project combines our expertise to analyze immune responses and how they become dysfunctional directly in humans. The fellow will be embedded in Dr. Balaguer's established national and international Lynch syndrome networks and receive personalized scientific mentorship and career advice.

Examples of secondments opportunities: German Cancer Research Center (DKFZ) (Heidelberg, Germany, Europe).

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RL12. Slow waves and the modulation of human cerebral cortex excitability: from circuit mechanisms to clinical applications

Key words: Epilepsy - Slow waves - Organotypic slices - Cortical excitability - Post-surgical prediction - Computational models.

Abstract: This research line investigates how slow waves regulate cortical excitability and interact with epileptiform activity, bridging mechanisms with clinical applications. The emergence of slow waves reflects altered excitability, whose physiological underpinnings we have analyzed. Under enhanced excitability (e.g., impaired inhibition), slow waves can transform into epileptiform discharges, as shown by Drs. Sanchez-Vives and Roldan in human cortical slices (Covelo et al., 2025). Reciprocally, slow waves modulate excitability, highlighting a mechanistic link between physiological and pathological dynamics. Clinical evidence shows that local slow waves interact with interictal discharges, modulating network excitability and influencing surgical outcomes in epilepsy (Sheybani et al. 2025). Establishing a new research line at IDIBAPS using organotypic human cortical slices from neurosurgical resections, we will dissect the circuit mechanisms by which slow waves constrain or facilitate ictal discharges and investigate neuromodulation interventions for their control. This experimental approach along with computational modelling will identify cellular and synaptic determinants of excitability and their modulation by rhythmic activity and exogenous interventions. By combining mechanistic insights with clinical neurophysiology, we aim to establish biomarkers and strategies to control hyperexcitability, predict surgical outcomes, and guide translational interventions for epilepsy.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Maria V. Sanchez Vives (msanche3@recerca.clinic.cat) Systems Neuroscience (Dr. Sanchez Vives Group)	Dr. Pedro Roldan (PEROLDAN@clinic.cat) Parkinson disease and other neurodegenerative movement disorders: clinical and experimental research (Dr. Martí Group)

About the co-supervision: The Basic/Translational group has a large experience in cortical dynamics, PhD training (+30 graduates), and integration of *in vitro*, *in vivo*, and computational approaches. Their expertise spans electrophysiology, imaging, photoswitchable agents, pharmacology, and modeling. The Clinical Group is a leading neurosurgery team with active surgical practice and strong scientific output. The groups are strongly committed to supporting the fellow through a combined scientific and career development. The project integrates cutting-edge experimental and clinical neuroscience, offering unique training in organotypic human cortical slices, circuit analysis, and translational applications. The groups will provide mentoring, access to advanced facilities, international collaborations, and support for

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publications, conference participation, and grant writing, ensuring the researcher's growth toward independence.

Examples of secondments opportunities: University of Geneva (Switzerland, Europe), University of Milan (Italy, Europe), CNRS Paris (France, Europe).

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RL13. Translational research in testicular cancer: liquid biopsy tumor biomarkers for precision clinical management and development of safe fertility preservation strategies

Key words: Testicular cancer - Molecular biomarkers - Liquid biopsy - Tumor diagnosis and prognosis – Sperm - Fertility preservation.

Abstract: Testicular cancer (TC) is the most frequent malignancy in young adult males of reproductive age. Despite its rising incidence, many biological mechanisms and diagnostic challenges remain unresolved. These include the lack of reliable tools to classify tumor subtypes at diagnosis, which often results in unnecessary orchiectomies; the absence of effective pre-surgical treatment options; the limited availability of robust methods for early cancer detection and identification of high-risk patients, such as those with testicular microcalcifications; and the safety of fertility preservation strategies. This research line addresses these gaps by integrating high-throughput molecular biology approaches. In particular, our research focusses on elucidating the molecular pathogenesis of TC to identify biomarkers in liquid biopsies (seminal fluid and blood). Such non-invasive biomarkers are intended to facilitate early detection, predict tumor progression and aggressiveness, and enable precise disease monitoring, ultimately enhancing patient care. We also explore the epigenetic impact of testicular tumors on adjacent germ cells. Tumor-induced alterations may compromise sperm quality and offspring health. Our goal is to characterize these changes and develop safe, evidence-based fertility preservation strategies. By bridging molecular insights with clinical needs, this research aims to contribute to precision medicine and to improve both survival and quality of life for patients with TC.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Judit Castillo (juditcastillo@ub.edu) Molecular biology of reproduction and development (Dr. Oliva Group)	Dr. Antonio Alcaraz (aalcaraz@clinic.cat) Genetics and urological tumors (Dr. Alcaraz Group)

About the co-supervision: The Molecular Biology of Reproduction and Development group is an international reference in the study of male reproductive biology and paternal contribution beyond fertilization. The Genetics and Urological Tumors Group has long-standing expertise in molecular characterization and clinical management of urological cancers, with strong scientific output and patents. Our groups are fully committed to the academic and professional development of the candidate, offering a multidisciplinary environment with clinical, molecular, and bioinformatic expertise in translational cancer research and male reproductive biology. The candidate will benefit from close supervision, access to advanced facilities, and opportunities for international collaboration and scientific dissemination. We aim to advance

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precision medicine in urological cancers and reproductive health, while fostering the development of independent, critical and leadership-driven researchers.

Examples of secondments opportunities: Radboud University Nijmegen Medical Centre (The Netherlands, Europe), Institute Curie and Institute Cochin (Paris, France, Europe), Vrije Universiteit Brussel (Belgium, Europe).

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RL14. Decoding the innate immune system in chronic liver disease

Key words: Immunity - Host defense against pathogens - Infections - Peripheral neutrophils - Liver macrophages.

Abstract: Our group investigates the cellular and molecular mechanisms underlying the inadequate immune response in patients with chronic liver disease, who exhibit a disproportionate systemic hyperinflammatory response accompanied by immunosuppression. These alterations have detrimental effects on these patients, rendering them, for example, more susceptible to recurrent infections. Two different approaches are included in this research line. The first one is to investigate the molecular mechanisms responsible for the presence of neutrophilia accompanied by lymphopenia in the systemic circulation, an imbalance that might have its origin in an abnormal functionality of the bone marrow. The second one is centered on liver immunity, investigating the mechanisms responsible for the impaired phagocytic function of the liver macrophages, i.e. Kupffer cells.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Joan Clària (jclaria@clinic.cat)	Dr. Javier Fernández (jfdez@clinic.cat)
Inflammation and liver disease (Dr. Clària Group)	Chronic liver diseases: molecular mechanisms and clinical consequences (Dr. Ginès Group)

About the co-supervision: The supervisors are performing translational and clinical studies interrogating the relationship between the malfunction of the innate immune system and the prevalence of infections. The group of Dr. Joan Clària comprises technicians, postdoctoral and predoctoral students and has strong expertise in omics, molecular biology, cell biology and experimental models of liver disease to perform mechanistic studies, while the group of Javier Fernandez Gómez comprises clinician-scientists and nurses. Together, the supervisors have directed more than 22 doctoral theses and more than 15 master theses. Joan Clària Enrich is full professor and Javier Fernández Gomez is assistant professor at the Barcelona University Medical School and are highly committed to supporting young researchers in their science and career development.

Examples of secondments opportunities: University of Munster (Germany, Europe), Hôpital Beaujon, INSERM (Paris, France, Europe), KU Leuven (Belgium, Europe).

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RL15. Effect of Syndromic PCR-Guided Treatment Adequacy on Respiratory Microbiome Alterations during Ventilator-associated pneumonia

Key words: Syndromic PCR - Ventilator-associated pneumonia - Microbiome - 16S profiling - Dysbiosis - Intensive Care Unit.

Abstract: This project explores how modern rapid diagnostic tools — specifically syndromic PCR panels — can improve the precision of antimicrobial treatment in respiratory infections, such as ventilator-associated pneumonia (VAP), and how this, in turn, affects the lung microbiome. You will investigate how timely and targeted treatments, guided by these molecular diagnostics, influence the balance of microbial communities in the lungs, aiming to reduce overuse of broad-spectrum antibiotics and prevent the disruption of beneficial microbiota. The research combines clinical data, microbiome sequencing, and bioinformatics analyses to uncover patterns of dysbiosis and recovery. As a predoctoral fellow, you will be involved in designing and conducting translational research with real-world clinical samples, contributing to a field that directly connects microbiology, infectious disease, and precision medicine. Your work could help shape more sustainable antimicrobial strategies and improve patient outcomes in critical care settings.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Laia Fernández (lfernan1@recerca.clinic.cat) Applied research in infectious respiratory diseases and critically ill patients (Dr. Torres Group)	Dr. Pedro Castro (pcastro@clinic.cat) Inherited Metabolic Diseases and Muscular Disorders (Dr. Garrabou Group)

About the co-supervision: Dr. Torres group is a worldwide leader in respiratory infections in critically ill patients. With 30 multidisciplinary researchers, it offers a unique translational setting—spanning basic science, clinical research, and advanced animal models. Torres lab is a vibrant, inclusive environment that welcomes international collaboration, routinely hosting fellows from around the world. You'll be mentored by global experts and empowered to grow within a dynamic, high-impact research culture. Dr. Garrabou group is a multidisciplinary and interdisciplinary team with diverse research lines, combining clinical and translational research on prevalent complications in critically ill populations, through projects that foster both knowledge acquisition and professional development. The Garrabou group is strongly committed to providing close supervision and mentorship by senior researchers, ensuring that a DYNAMIS fellow will benefit from a stimulating environment that actively supports scientific advancement and career growth.

Examples of secondments opportunities: Nantes University (France, Europe), University of Michigan (US).

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RL16. Deciphering the Immunosuppressive Role of Cancer-Associated Fibroblasts in Biliary Tumors

Key words: Tumor microenvironment - Immunosuppression - Cancer-associated fibroblasts - Spatial-omics - Preclinical models - Targeted therapies.

Abstract: With this research line we aim to decipher the emergence and evolution of immunosuppressive cancer-associated fibroblasts (CAFs) in hepatobiliary malignancies, starting from intrahepatic cholangiocarcinoma as a unique model to understand how CAFs participate in resistance to therapy. By integrating cutting-edge experimental models, high-resolution transcriptomic profiling including single-cell and spatial approaches, and clinically annotated patient datasets, we will investigate the cellular origins, molecular trajectories, and immunomodulatory functions of CAFs. This interdisciplinary strategy will enable the identification of key drivers of CAF-mediated immune evasion and therapy resistance. Ultimately, this research line seeks to uncover novel therapeutic targets and inform the rational design of combination strategies that effectively disrupt CAF-driven immunosuppression, thereby enhancing treatment efficacy and patient outcomes.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Silvia Affò (saffo@recerca.clinic.cat) Tumor microenvironment plasticity and heterogeneity (TMHet) (Dr. Affò Group)	Dr. Alejandro Forner (AFORNER@clinic.cat) Hepatic oncology (BCLC) (Dr. Reig Group)

About the co-supervision: The hosting groups offer a highly complementary and translational environment. Dr. Affò's lab studies CAF plasticity and tumor microenvironment heterogeneity in desmoplastic tumors using advanced preclinical models and state-of-the-art omics. The group of Dr. Forner leads international clinical studies on detection and treatment response in liver cancer. Together, they provide interdisciplinary training, networking, and opportunities to address real-world clinical challenges, supporting impactful bench-to-bedside research. This is a unique opportunity to grow at the interface of basic and clinical research, addressing real-world challenges within IDIBAPS—a leading center in translational medicine.

Examples of secondments opportunities: German Cancer Research Center DKFZ (Heidelberg, Germany, Europe), University of Edinburgh and University of Glasgow (UK, Europe), Icahn School of Medicine at Mount Sinai (ISMMS) (New York, US).

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RL17. Early-onset serrated polyposis syndrome: clinical and molecular characterization

Key words: Serrated polyposis syndrome - Colorectal cancer - Next Generation Sequencing - Early-onset disease - Clinical study.

Abstract: Serrated polyposis syndrome (SPS) is a condition characterized by the presence of multiple and/or large serrated polyps in the colorectum and an increased risk of CRC (Carballal et al., Best Pract Res Clin Gastroenterol, 2022). Familial aggregation has been reported in a subset of cases, supporting a possible hereditary component. Our group has conducted pioneering work in the field, studying the germline and tumor DNA of 39 SPS patients from 16 families, with subsequent replication in an extended cohort of 211 patients. We have functionally tested five candidate genes for their involvement in SPS predisposition (Sores de Lima, J Med Genet, 2023; Dominguez-Rovira, Int J Cancer, 2025). Building on this expertise, we focus now on a subgroup of patients diagnosed with SPS ≤50. Besides being an interesting cohort to study from the clinical point of view, focusing on early-onset SPS could help unravel additional genes for SPS germline predisposition. Early presentation of disease is a surrogate for a hereditary basis. Our previous experience in CRC and SPS will be key in analyzing them at the clinical and genetic level.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Sergi Castellví-Bel (sbel@recerca.clinic.cat) Genetic predisposition to gastrointestinal cancer (Dr. Castellví-Bel Group)	Dr. Sabela Carballal (carballal@clinic.cat) Gastrointestinal and pancreatic oncology (Dr. Castells Group)

About the co-supervision: We produce high-impact research aimed at improving health and quality of life. We seek national and international collaborations to maximize our achievements. We also support diversity, inclusion, transparency and integrity, which are key in attaining excellence. Our supportive environment empowers every team member, encouraging personal and professional growth. We publish open-access, develop clinical guidelines and facilitate innovation, engage with patient advocacy groups, and maintain open-door laboratory activities. The selected candidate will benefit from comprehensive training in translational cancer research, including participation in national and international conferences to present project results. The fellow is expected to lead at least 3 publications and develop a doctoral thesis. Career development will be further supported by participation in the activities of our institution.

Examples of secondments opportunities: Institut für Humangenetik (UKB) (Bonn, Germany, Europe), Amsterdam University Medical Center - Radboudumc, Nijmegen - Princess Maxima Center for Pediatric Oncology, Utrecht - GenomeScan, Leiden (The

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Netherlands, Europe), Instituto Português de Oncologia de Lisboa Francisco Gentil (IPOLFG) (Lisbon, Portugal, Europe).

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RL18. Identification of immune signatures and therapeutic response biomarkers in Eosinophilic granulomatosis with polyangiitis (EGPA) using single-cell transcriptomics and functional immunopathway analysis

Key words: EGPA - Systemic vasculitis - Biomarkers - Targeted therapies – Omics - Predictors of response.

Abstract: EGPA is a rare antineutrophil cytoplasmic antibody (ANCA)-associated vasculitis characterized by eosinophil-rich inflammation and asthma. Although glucocorticoids and anti-IL-5 therapies have significantly improved disease management, many patients continue to experience relapses or persistent symptoms. Given the high cost of targeted therapies and the adverse effects of glucocorticoid use, identifying reliable biomarkers to predict therapeutic response and uncovering novel inflammatory and remodeling pathways remains a major unmet need. Our group has been working on this research line with competitive funded projects. CD4+ T cells may play a key role in EGPA, since preliminary bulk transcriptomic analyses by our group have revealed significantly altered gene expression profiles in patients compared to controls. Following validation, these findings were used to build a pharmacogenomic network to explore novel therapeutic approaches. Our studies also showed a dysregulated Th2 immune profile in EGPA patients, supporting investigation of Th2-targeted therapies and their impact on T cell function. Dupilumab, an IL-4/IL-13 receptor blocker, has shown off-label benefit in some patients, though the mechanisms behind its potential synergy with IL-5 blockade remain unclear. We aim to identify transcriptional signatures and immune subsets responsive to IL-5 and/or IL-4/IL-13Rα blockade using single-cell transcriptomics in T cells from EGPA patients, complemented by functional pathway analysis of dysregulated immune responses.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Georgina Espígol Frigolé (gespigol@clinic.cat)	Dr. Laura Llaó-Cid (llao@recerca.clinic.cat)
Systemic vasculitis (Dr. Cinta Cid Group)	Molecular pathology of lymphoid neoplasms (Dr. Campo Group)

About the co-supervision: The Systemic Vasculitis group led by Dr. Cid investigates inflammatory and vascular remodeling mechanisms in vasculitis using targeted and omics approaches, functional models, clinical cohorts and clinical trials. The Molecular Pathology of Lymphoid Neoplasms group led by Dr. Campo, applies advanced molecular and single-cell techniques to study lymphomas and their microenvironment, with strong bioinformatics expertise and access to high-level infrastructure (BCN Supercomputing Center). Both groups promote a positive working environment through excellent research and regular group meetings. Both supervisors are committed to guiding a DYNAMIS fellow, providing regularly one-on-one meetings, training in cell and molecular techniques, single-cell RNA-seq and

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bioinformatics analysis, plus expert knowledge in immunology and vascular inflammation and remodeling.

Examples of secondments opportunities: German Cancer Research Center DKFZ (Heidelberg, Germany, Europe), National Institutes of Health (NIH) (Bethesda, US).

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RL19. Multimodal artificial intelligence to predict immunotherapy outcomes in triple-negative breast cancer

Key words: Immunotherapy - Radiology – Artificial Intelligence (AI) - Genomics - Computer vision - Bioinformatics.

Abstract: Triple-negative breast cancer (TNBC) is an aggressive tumor subtype where only a subset of patients benefits from immune checkpoint therapies (ICT). As ICT adds toxicity and cost, predicting responders remains an unmet need. This project aims to build artificial intelligence models that integrate mammography, gene expression, and immune profiling data to predict ICT efficacy in early TNBC. Gene expression assays are already used in breast cancer care, and Dr. Prat has developed clinically validated TNBC-specific tools (e.g., TNBC-Dx). Dr. Walle has developed AI models predicting ICT response from immune cell states in blood and brings expertise in machine learning for single-cell and bulk data. Mammography, a standard imaging modality, captures submillimeter tumor architecture which is associated with immune infiltration and treatment response. Combining these distinct sources of information promise enhanced identification of patients benefiting from ICT. The candidate will develop multimodal AI models including model fusion, graph-based fusion, and transformer-based architectures. Integrating routine clinical laboratory values collected during therapy will allow dynamic, time-updated predictions of response. Given the combined computational and clinical expertise and the huge corpus of available training data, the resulting models can be easily translated to impact clinical decision-making, reduce ICT-associated risks, and personalize therapy for early-stage TNBC patients.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Thomas Walle (academic@recerca.clinic.cat) Computational Cancer Biomedicine (Dr. Walle Group)	Dr. Aleix Prat (alprat@clinic.cat) Translational genomics and targeted therapies in solid tumours (Dr. Prat Group)

About the co-supervision: Dr. Walle leads the new Junior Research Group in Computational Cancer Biomedicine at IDIBAPS, while Dr. Prat is the Director of the Clínic Barcelona Comprehensive Cancer Center and founder of RevealGenomics. This project combines their expertise to go beyond theoretical models and mentor the DYNAMIS fellow to build AI tools with direct clinical utility. Clinical AI, in fact, requires cross-disciplinary expertise across Oncology, Biology, and Computer Science. The DYNAMIS fellow will be embedded in an international network, gaining exposure to both academic and industrial settings, and receiving personalized mentorship to develop both scientific and career skills.

Examples of secondments opportunities: Helmholtz Munich (Germany, Europe).

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RL20. Unraveling early systemic immune reprogramming in cholangiocarcinoma using single cell multiomics

Key words: Bioinformatics - Single cell genomics - Immunotherapy - Spatial transcriptomics, Multiomics - Epigenetics.

Abstract: Patients with cholangiocarcinoma (CCC) face a poor prognosis and are in dire need of early detection and effective treatment. While immune checkpoint therapy has improved prognosis of advanced CCC patients, most tumors evade effective immune recognition. Because previous studies focused on tissue-based analyses of invasive tumors, it remains unclear how these immune evasion processes are initialized either locally or at the organismal level. We hypothesize that initially reversible immune escape emerges early both locally and systemically during tumorigenesis. To address this, the DYNAMIS candidate will analyze single cell genomics data from circulating immune cells using single cell genomics using state-of-the-art bioinformatic methods with the option to extend existing methods for time-course analysis. We will focus on well-defined high-risk patient populations (e.g. primary sclerosing cholangitis) before and after tumor outgrowth. Using paired single cell gene expression and chromatin accessibility (multiome), the candidate will characterize the epigenetic reprogramming patterns leading to the observed gene expression changes. Combining these analyses with spatial transcriptomics with paired T cell receptor sequences will help the candidate separate tissue-specific cues from systemic immunosuppression. The DYNAMIS student will thereby map the evolution of immunological programs across CCC tumorigenesis with implications for diagnosis and cancer therapy.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Teresa Macarulla (macarulla@clinic.cat) Translational oncology in upper gastrointestinal cancers (Dr. Macarulla Group)	Dr. Thomas Walle (academic@recerca.clinic.cat) Computational Cancer Biomedicine (Dr. Walle Group)

About the co-supervision: Single cell genomics data encompassing transcriptome and chromatin accessibility enable us to obtain a holistic picture of how immune cells are reprogrammed in cancer. However, their analysis requires both computational biology expertise as well as insight into disease biology. The DYNAMIS candidate will be co-mentored by Dr. Macarulla — Director of Medical Oncology at Clínic Barcelona and an internationally recognized expert in cholangiocarcinoma — and Dr. Walle, who leads the new Junior Research Group in Computational Cancer Biomedicine at IDIBAPS. Together, they will guide the candidate in analyzing these challenging data and build new tools to identify longitudinal gene regulatory networks in early immune reprogramming. The student will be embedded into

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the international networks of Dr. Macarulla and Dr. Walle, offering career and networking opportunities.

Examples of secondments opportunities: German Cancer Research Center DKFZ (Heidelberg, Germany, Europe).

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RL21. Predictive factors of treatment response in liver cancer: Non-Invasive Precision Medicine in HCC: Dynamic Monitoring with cfDNA Fragmentomics and Biomarkers to Optimize Immunotherapy

Key words: Hepatocellular carcinoma (HCC) - Immunotherapy response - Precision medicine - Liquid biopsy - cfDNA fragmentomics - Tumor plasticity.

Abstract: This research line focuses on non-invasive precision medicine in hepatocellular carcinoma (HCC), with emphasis on predictive biomarkers of treatment response and resistance. It integrates expertise in clinical hepatology, translational oncology, and molecular technologies to study tumor plasticity and disease progression under immunotherapy. This multidimensional approach enables dynamic monitoring of tumor evolution and helps identify factors that anticipate progression, aggressiveness, or therapeutic resistance. The fellow will primarily focus on cfDNA fragmentomics and circulating biomarkers as the core of the project, while radiomics and plasticity will serve as complementary layers to integrate biological and clinical insights. Our co-supervision model ensures interdisciplinarity, involving a clinical team and a molecular biology lab, with expertise ranging from basic mechanisms to societal interaction through the UB–BCLC Chair. The line is integrated into an international network, offering diverse research environments. The team also engages in dissemination, training, and outreach, raising awareness of HCC research and fostering dialogue between science, healthcare, and the community. We offer a consolidated, international, and socially framework to host doctoral projects, ensuring excellence, fostering innovation, and providing an environment where fellows acquire independence and critical vision to address the complexity of HCC and lead future advances in the field.

Co-supervisors

Clinical	**Basic/Translational**
Dr. María Reig (mreig1@clinic.cat) Hepatic oncology (BCLC) (Dr. Reig Group)	Dr. Albert Morales (AMORALES@clinic.cat) Hepatocellular signaling and cancer (Dr. Morales Group)

About the co-supervision: The groups bring complementary expertise in clinical care, seeing >350 new patients per year with and engaging in research and innovation, as well as translational research and molecular mechanisms of liver cancer. They provide an interactive, inclusive environment where findings are rapidly transferred to patients and newcomers are supported by a strong scientific and social network. The groups are committed to fostering the fellow's scientific growth and career prospects. They will provide high-level supervision, structured mentoring, and training in transferable skills, while actively supporting international secondments, doctoral schools, and conference participation. Through complementary co-supervision, access to advanced platforms, and a strong international network, the goal is to

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help the fellow become an independent researcher in a socially engaged environment where discoveries quickly reach patients.

Examples of secondments opportunities: Cordeliers Research Center - INSERM 1138 (Paris, France, Europe), Cancer Center Clinica Universidad de Navarra (Pamplona, Spain, Europe), State Key Laboratory of Translational Oncology (CUHK) (Hong Kong, China).

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RL22. Identifying single-cell-based biomarkers and mechanisms of response and resistance to immunotherapies in solid tumors

Key words: Immunotherapy - Spatial transcriptomics - Tumor microenvironment – Biomarkers - Melanoma - Hepatocellular carcinoma.

Abstract: Cancer is shaped by complex interactions within the tumor microenvironment (TME). Advances in single-cell and spatial transcriptomic technologies have revealed that immune infiltration status ("hot" vs. "cold" tumors) is associated with immunotherapy response. Sinonasal mucosal melanoma (SNMM), a rare and aggressive melanoma subtype, differs from cutaneous melanoma in its genomic profile, making it difficult to treat with current therapies. Hepatocellular carcinoma (HCC), the most common form of liver tumors, is an aggressive and difficult-to-cure cancer. Immune therapy-based combinations improve outcomes for ~30% of HCC patients, highlighting the need for novel treatments to overcome resistance. In this project, we will (1) characterize the tumor microenvironment of SNMM and HCC using spatial transcriptomics; and (2) identify predictors of response/resistance to immunotherapies in SNMMs and HCC patients by integrating spatial and molecular data. For the TME characterization and identification of mechanisms of response/resistance, tumors will be profiled using single-cell and spatial RNA sequencing. For biomarker discovery, we will integrate single cell, spatial and RNA sequencing data, with clinical information. Overall, the project will broaden knowledge of how the TME mediates response to immune therapies, facilitate the identification of novel treatment approaches to overcome resistance, and promote precision oncology through the discovery of predictive biomarkers.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Josep M. Llovet (jmllovet@clinic.cat)	Dr. Susana Puig (spuig@clinic.cat)
Translational research in hepatic oncology (Dr. Llovet Group)	Melanoma: imaging, genetics and immunology (Dr. Puig Group)

About the co-supervision: Both the Translational Research in Hepatic Oncology Group and the Melanoma: Imaging, Genetics & Immunology Group are internationally recognized teams integrating clinicians, bioinformaticians and wet-lab scientists. The liver cancer group focuses on pathogenesis and treatment of liver cancer, with 376 top-tier publications and 129 projects (~60M€). The melanoma group advances prevention, early diagnosis and personalized treatments. The participating groups are highly committed to supporting a DYNAMIS fellow with strong mentoring in cancer immunology, translational oncology, and advanced multi-omics. The fellow will join a multidisciplinary team with access to cutting-edge technologies (spatial transcriptomics, single-cell, immunogenomics, artificial intelligence) and patient cohorts with accurately annotated clinical data. The groups aim to integrate the fellow into

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international networks in cancer research and to foster his scientific independence by providing a tailored career development plan.

Examples of secondments opportunities: Ichan School of Medicine at Mount Sinai (New York, US), University of Tübingen (Germany, Europe), INSERM and University of Paris (France, Europe), University of Manchester (UK, Europe).

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RL23. Elucidating the mechanisms of aSynuclein aggregation in LRRK2 Parkinson's disease cohorts

Key words: Parkinson's disease (PD) - Leucine-rich repeat kinase 2 gene (LRRK2) - aSynuclein protein (aSyn) - Lewy bodies (LBs) - Neurodegeneration - Neuroscience.

Abstract: Parkinson's disease (PD) is the fastest-growing neurodegenerative condition worldwide, leading to disabling motor and nonmotor features. Its neuropathological diagnosis requires the presence of neuronal aSynuclein (aSyn) aggregates, the so-called Lewy bodies and neurites (Lewy-type pathology [LTP]), that progressively spread throughout the brain as the disease evolves. Mutations at the leucine-rich repeat kinase 2 (LRRK2) are the most frequent genetic cause of PD (L2PD) and the best clinical model for idiopathic PD (iPD; 95% of cases). Yet, up to 50% of L2PD brains lack aSyn aggregates. Accordingly, the diagnostic biomarker aSyn seed amplification assay (aSyn SAA) is positive in cerebrospinal fluid (CSF) from only around 50% of L2PD. By contrast, proximity ligation assays (PLA) report abundant non-fibrillar oligomeric aSyn in LTP-negative L2PD brains, illustrating aSyn involvement even in the absence of LTP. In an outstanding translational training setting, you will have the opportunity to elucidate differential mechanisms of aSyn aggregation by mutant LRRK2 using unique L2PD clinical (n=70) and neuropathological cohorts (n=30). Here you will study differential aSyn species in aSyn-positive vs. negative L2PD brain and CSF samples by mass-spectrometry, along with neuropathological and aSyn SAA comprehensive characterisations. In our vibrant multidisciplinary team in Barcelona, you will investigate aSyn aggregation mechanisms in PD with implications for future therapies.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Rubén Fernández-Santiago & Dr. Yaroslau Compta (ruben.fernandez.santiago@gmail.com; YCOMPTA@clinic.cat)	Dr. Iban Aldecoa (IALDECOA@clinic.cat)
Parkinson disease and other neurodegenerative movement disorders: clinical and experimental research (Dr. Martí Group)	Molecular pathology of inflammatory conditions and solid tumours (Dr. Cuatrecasas Group)

About the co-supervision: Dr. R. Fernández-Santiago (neuroscientist) and Dr. Y. Compta (PD neurologist) are designated co-leads of the IDIBAPS Parkinson's Lab (27 members), which is dedicated to translational research of disease mechanisms and biomarkers in monogenic PD, prodromal PD, and atypical parkinsonisms. Dr. Fernández-Santiago is an expert in LRRK2 biology, whereas Dr. Y Compta pioneered aSyn SAA. Dr. I Aldecoa (neuropathologist) leads the aSynucleinopathy research line at the Pathology's Lab (15 members) and the IDIBAPS Neurological Tissue Bank (8 members), and is focused on diverse neuropathological studies.

Examples of secondments opportunities: University of Dundee (UK, Europe).

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RL24. Reprogramming Immunity: CAR-T Cell Therapy to Halt Pulmonary Fibrosis

Key words: Immunotherapy - CAR-T cells - Pulmonary fibrosis - Personalized medicine.

Abstract: Pulmonary fibrosis is a devastating, progressive disease in which excessive scarring of the lung severely limits breathing and has few effective treatment options. Our research line pioneers an innovative approach: harnessing the immune system to halt or reverse fibrosis by adapting CAR-T cell therapy—a breakthrough technology from oncology—to target the pathogenic cells that drive fibrotic progression. This strategy represents a transformative shift in how chronic lung diseases are addressed, moving beyond symptom management toward precision cellular intervention. We work directly with human patient samples, combining state-of-the-art immunoengineering with high-dimensional immune profiling, single-cell transcriptomics, and cutting-edge cell culture platforms using precision-cut lung slices (PCLS) as ex vivo models to preserve native tissue architecture and microenvironment. This patient-focused methodology ensures that therapeutic designs are directly informed by the biology of the disease in those affected, increasing translational relevance and accelerating the path from concept to clinic. Our goal is to open a new chapter in immunotherapy—one in which reprogrammed immune cells become tools not only to fight cancer, but also to restore lung function and improve quality of life in patients with fibrosis.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Azucena González (EAGONZAL@clinic.cat) Immunogenetics and immunotherapy in autoinflammatory and immune responses (Dr. Juan Group)	Dr. Tamara Cruz (cruz@recerca.clinic.cat) Inflammation and repair in respiratory diseases (Dr. Agustí Group)

About the co-supervision: Our environment unites two IDIBAPS groups: Immunogenetics & immunotherapy and Inflammation & repair in respiratory diseases. The immunology group is pioneering CAR-T cell therapy in Spain, while the pulmonary group has groundbreaking work on immunological alterations in pulmonary fibrosis. With complementary expertise, strong clinical links, and a culture of innovation, we offer a unique, inspiring setting for impactful, patient-focused research and outstanding training. We are committed to supporting the career development of the DYNAMIS fellow by offering tailored mentorship, guidance, and training that fosters independence, leadership, and scientific maturity.

Examples of secondments opportunities: Ludwig Center for Cancer Research (Lausanne, Switzerland, Europe), UCLA Jonsson Comprehensive Cancer Center (JCCC) (Los Angeles, US).

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RL25. Circuit mechanisms underlying working memory deficits in anti-NMDA receptor encephalitis

Key words: NMDA receptors - Autoimmune synaptopathies - Active immunization - Working memory - Pre-frontal cortex - Neuronal engram.

Abstract: In this research line we aim to understand the circuit mechanisms of working memory (WM) deficits exhibited by patients with anti-NMDA receptor encephalitis (aNMDARe) (Dalmau et al., Annals of neurology, 2007). For that, we will use a mouse model of aNMDARe recently developed by the group of Dr Dalmau (Maudes et al., Brain, 2025) and we will focus on investigating deficits in working memory (WM) (Oña-Jodar et al., bioRxiv, 2024). We will use our deep behavioral phenotyping platform, Training Village (https://braincircuitsbehaviorlab.github.io/village/), to train mice in these complex tasks and characterize the deficits caused by NMDAR hypofunction. Our central hypothesis is that the connectivity of WM neural engrams is regulated by activity- and NMDAR-dependent plasticity, causing adaptations of the engram connectivity which are instrumental for WM function. Such plasticity may be defective in aNMDARe models. We will use light- and calcium-gated labeling methods to first causally test the maintenance dynamics of WM. We will then stimulate these engrams using optogenetics to test how plasticity within engram neurons affects WM maintenance. Finally, we will mimic the disruption of this plasticity in our anti-NMDARe model and study how it results in behavioral deficits observed in the task. Together our research will reveal fundamental mechanisms of cognition and their alteration in brain disease.

Co-supervisors

Basic/Translational	**Clinical**
Dr. Jaime De La Rocha (jrochav@recerca.clinic.cat) Cortical circuit dynamics (Dr. De La Rocha Group)	Dr. Josep Dalmau (JDALMAU@clinic.cat) Pathogenesis of autoimmune neuronal disorders (Dr. Dalmau Group)

About the co-supervision: This project is a collaboration between the Brain Circuits and Behavior Lab co-led by Dr de la Rocha and the Group of "Pathogenesis of autoimmune neuronal disorders" led by Dr Dalmau. The two teams integrate researchers with different backgrounds ranging from biomedicine, bioengineering, medicine, physics, math, computer science and psychology. The BCB lab is also an active node of the BARCCSYN community. We promote research quality, personal development, collaboration, gender equality, sustainable and open science and work-life balance. Every 1-2 weeks, students meet for ~1.5 hours with the PIs to touch base and discuss anything related to work. This is the essential meeting in which students receive scientific guidance on their projects or advice on any issues they may be experiencing.

Examples of secondments opportunities: Trinity College Dublin (Ireland, Europe), Champalimaud Foundation (Lisbon, Portugal, Europe), Institute of Mediterranean

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Neurobiology (INMED) (Marseille, France, Europe), Universitätsklinikum Hamburg-Eppendorf (UKE) (Hamburg, Germany, Europe), Max Plank Institute (MPI) for Biology (Tübingen, Germany, Europe), Nencki Institute of Experimental Biology (Warsaw, Poland, Europe), Neurocentre Magendie (Bordeaux, France, Europe), Jena University Hospital (Germany, Europe).

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RL26. Decoding Sleep and Learning in Autoimmune Encephalitis: From Brain Circuits in Animal Models to Human Mechanisms through Computational Neuroscience

Key words: Autoimmune encephalitis - Systems neuroscience - Deep phenotyping - Human and animal models - Sleep - Learning.

Abstract: Autoimmune encephalitis (AE) is a severe neurological disorder marked by cognitive deficits, behavioral changes, seizures, and sleep disturbances. NMDAR and LGI1 encephalitis, the most frequent forms, are caused by autoantibodies targeting synaptic proteins, leading to neuronal dysfunction, memory and learning deficits, and disrupted sleep. The specific brain circuits underlying these deficits, and how altered sleep contributes to cognitive impairment, remain poorly understood. LGI1 encephalitis mainly affects the limbic system, critical for memory and learning, while NMDAR encephalitis is more widespread, often accompanied by movement disorders and psychiatric symptoms, reflecting basal ganglia and frontal cortex involvement. Sleep disturbances include insomnia, REM sleep behavior disorder, and fragmented slow-wave sleep, yet the underlying circuits are unexplored. We propose an interdisciplinary project to map the neural circuits of learning, memory, and sleep in NMDAR and LGI1 encephalitis. Using active immunization mouse models, we will employ automated cognitive training, computational modeling, video tracking, behavioral segmentation, and wireless sleep monitoring to identify circuit-specific dysfunctions. Optogenetics will interrogate connectivity and function. Findings will be translated to patients through behavioral and sleep assessments to reveal whether similar circuits are disrupted in humans and to elucidate the interplay between sleep and learning in AE.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Marianna Spatola (SPATOLA@recerca.clinic.cat) Pathogenesis of autoimmune neuronal disorders (Dr. Dalmau Group)	Dr. Hernando Martinez Vergara (hmartinez@recerca.clinic.cat) Cortical circuit dynamics (Dr. De La Rocha)

About the co-supervision: Dr. Spatola is an MD-PhD and neurologist leading a translational neuroimmunology group of clinicians and basic scientists studying autoimmune encephalitis through microscopy, flow cytometry, and animal models. Dr. Martinez, PhD, leads a systems neuroscience group employing automated behavioral setups, computational analysis, and neuronal recording in rodents. Both are part of a multidisciplinary program spanning synaptic autoimmunity (Dr Dalmau) and cognitive neuroscience (Dr De la Rocha and Dr Compte) with joint meetings and journal clubs fostering interdisciplinary training for students. Drs. Spatola and Martínez view the DYNAMIS program as an outstanding opportunity to establish a collaborative PhD project at the interface of immunology and neuroscience. They are committed to ensuring the project integrates cutting-edge tools from both fields, while the

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student benefits from rigorous co-supervision, advanced training courses, and international internships. This combination will provide scientific, interdisciplinary, and career development experiences, preparing the researcher to become a next-generation leader in translational neuroscience.

Examples of secondments opportunities: Netherlands Institute of Neuroscience (Amsterdam, The Netherlands, Europe).

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RL27. Brain mechanisms of neuropsychiatric symptoms in schizophrenia: insights from autoimmune encephalitis as a model of NMDA receptor hypofunction

Key words: NMDA receptors - Autoimmune encephalitis - Schizophrenia - Magnetic resonance imaging (MRI).

Abstract: We aim to investigate the brain mechanisms underlying neuropsychiatric symptom expression through the study of patients with anti-NMDAR encephalitis (anti-NMDARe). This disorder represents a human model of NMDA receptor hypofunction, offering a unique opportunity to elucidate how NMDAR disruption contributes to other neuropsychiatric conditions such as schizophrenia. Anti-NMDARe is a rare autoimmune disease characterized by acute psychiatric symptoms at onset and cognitive impairment during the recovery stage, sharing clinical and developmental features with schizophrenia.

Our groups have established a joint research line comparing patients with anti-NMDARe and schizophrenia and have recently developed an active immunization animal model of the disease.

Aim: To characterize brain mechanisms of neuropsychiatric symptoms in post-acute anti-NMDARe compared with schizophrenia using multimodal neuroimaging, including magnetic resonance spectroscopy, neuromelanin-sensitive MRI, and structural and functional MRI.

Longitudinal assessments will clarify trajectories of neural dysfunction and recovery, disentangle shared and distinct pathophysiological mechanisms, and identify imaging biomarkers predictive of clinical outcomes. Parallel imaging in the animal model will further elucidate the temporal sequence of brain changes linked to NMDA receptor dysfunction from the acute to subacute disease stages.

Co-supervisors

Clinical	**Basic/Translational**
Dr. Gisela Sugranyes (gernest@clinic.cat) Multimodal neuroimaging in high risk and early psychosis (Dr. Sugranyes Group)	Dr. Albert Compte (acompte@recerca.clinic.cat) Theoretical neurobiology of cortical circuits (Dr. Compte Group)

About the co-supervision: The Multimodal Neuroimaging High Risk Early Psychosis Group studies brain changes during the early phases of psychotic disorders in the context of development. The co-supervising Theoretical Neurobiology of Cortical Circuits Group focuses on computational modeling of cortical circuits, linking neural dynamics to cognition and psychiatric disease. Both teams integrate advanced MRI and modeling with clinical expertise in a collaborative, multidisciplinary environment fostering innovation, training, and international exchange. Dr. Sugranyes is a psychiatrist specializing in brain imaging of neuropsychiatric conditions, holding a 50/50 academic-clinical post, which ensures research remains clinically relevant. Dr. Compte is a cognitive neuroscientist skilled in computational and rodent models

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of brain function. Both supervisors have a strong PhD supervision record, international recognition, and established structures for regular supervision and professional development.

Examples of secondments opportunities: Columbia University and New York University (NYU) (New York, US), University of Maryland (US), UC Davis (California, US), King's College London (UK, Europe), Institut de Neuromodulation (INM) Paris (France, Europe).

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