2026 Call for the IRB Barcelona International PhD Fellowships Programme (ref.01/26.1/IRB)

TERMS & CONDITIONS

Section II, article 6, letters c) and q) of the Articles of Association of the *Fundació Institut de Recerca Biomèdica (IRB Barcelona)* (hereafter referred to as IRB Barcelona or the Institute) establish that the Institute will promote activities that address collaboration and knowledge transfer and also launch fellowship calls and subsequent granting of these awards.

Accordingly, this document is to announce a fellowship call included in the IRB Barcelona International PhD Programme. The fellowships are assigned to students enrolled on a PhD programme who perform and defend their PhD theses under the supervision of group leaders at IRB Barcelona.

I. Objective

These Terms and Conditions serve to regulate the award of PhD fellowships for the academic year 2026–2027.

II. Fellowship Call

The following will be offered in this call:

- Up to 7 doctoral contracts associated with the Severo Ochoa Accreditation 2023, funded by the "Ministerio de Ciencia e Innovación (MICINN)" (herein referred to as Severo Ochoa doctoral contracts).
- Up to 8 FPI doctoral positions associated with the "Proyectos de Generación de Conocimiento 2025" Call (funded by the Agencia Estatal de Investigación AEI-MICINN).

The FPI positions will be regulated by the MICINN call, following the conditions of this government agency. Details of the evaluation criteria are provided in Annex 2.

All fellowship awardees will be contracted by IRB Barcelona. Fellowships will be renewable on a yearly basis and up to 4 years from the date of signature of the employment contract by the awardee, provided that he/she complies with all the requirements of point X of this call.

The awardee's supervisor will be the group leader at IRB Barcelona previously assigned and agreed with the awardee before the signature of the fellowship. This group leader will oversee that the duties assigned to the awardee are fulfilled and will notify IRB Barcelona's Academic Office and the Chair of the Academic Advisory Committee of any incident, alterations in the fulfilment of the allocated duties, or other pertinent circumstances so that corrective measures can be applied and/or proceedings can be started to withdraw the fellowship.

III. Requirements and Selection Criteria

IRB Barcelona will recruit prospective doctoral candidates of any nationality, gender, culture, religion, sexual orientation or age to undertake a PhD in biomedicine.

1. The programme is aimed at students who have completed one of the following options by September 2026:

a) Studies that lead to an official Spanish (or from another country of the European Higher Education Area) university degree in Biology, Chemistry, Biochemistry, Pharmacy, Physics, Medicine or related fields and that have 300 credits (ECTS), of which at least 60 must correspond to master level.
b) A degree in a non-Spanish university not adapted to the European Higher Education Area and that gives access to doctoral studies in Biology, Chemistry, Biochemistry, Pharmacy, Physics, Medicine or related fields in Spain.

2. Candidates are selected exclusively on merit, on the basis of their curricula. The academic grades and curriculum vitae of each applicant are evaluated, as well as recommendation letters and a motivation letter. No selection criteria for positive or negative discrimination are applied.

Applicants should indicate the Research Cluster(s) and/or Research Group(s) to which they wish to apply (up to 3, in total). Details of the projects available are provided in Annex 1.

IV. Application Procedure

1. Applications can be made online at http://phd.irbbarcelona.org/. The application deadline is 15:00 CET on 9 January 2026.

The tentative calendar for this call is as follows:

Call opening: 5 November 2025
Deadline for applications: 9 January 2026, 15:00 CET
Deadline for referee submissions: 12 January 2026, 15:00 CET
Remote evaluation: 2–6 February 2026
Group Leader Panel presentations: 26 February 2026
Interviews at IRB Barcelona: 10–11 March 2026

Notification to candidates: 20 March 2026
Fellowships start date: from September 2026

If the application deadline is extended, the updated information will be available on the IRB Barcelona's website.

2. For more information, applicants can consult IRB Barcelona's webpage or contact IRB Barcelona's Academic Office at academicoffice@irbbarcelona.org.

V. Applications

Applicants should send a completed online application form, together with the following documents:

1. Curriculum vitae specifying education and experience, including career breaks, and supported by pertinent documents.
2. A motivation letter (maximum 2 pages) highlighting their research experience and academic achievements and explaining why they are interested in IRB Barcelona and in a particular research group.
3. A scanned copy of their certified Academic Record. These documents must show the grades. If the certified academic records are not in Spanish, Catalan or English, applicants should also attach a translation in one of the above-mentioned languages.
4. Any additional files considered relevant to the application
5. Two recommendation letters from university lecturers or scientists with whom they have studied or worked. Candidates are responsible for ensuring that referees submit these letters. Applications not supported by these letters will not be eligible. If the applicant has previously worked with a researcher at IRB Barcelona, any letter of reference from said person cannot be included as one of the two reference letters requested. However, it can be sent to provide additional support for the application.

Applicants will be asked to upload the following documents in English. Please note that all the documents provided should be in PDF format.

VI. Selection

An Evaluation Committee will appraise eligible. This committee will have representatives of group leaders at IRB Barcelona. The evaluation will be independent, impartial, objective, and free of conflicts of interest, and the selection will be open, efficient, transparent, fair, and merit-based. The Academic Advisory Committee and Academic Office will oversee the remote and interview stages of the selection process.

Applicants will receive continuous support from the Academic Office through the helpdesk (email, phone), which will notify them of the outcome of the preselection.

Candidates with the highest scores will be invited for an online interview. Those who do not pass the threshold established will be excluded from further consideration and will be informed.

Short-listed candidates will receive an invitation to a two-day interview process held at IRB Barcelona. Teleconference interviews will be used only for candidates with prior commitments that cannot be rearranged and that thus prevent them from travelling to Barcelona.

Offers of admission will be made to the successful candidates shortly after the interview period. Candidates positively evaluated but with an insufficient score to receive a fellowship will be put on a reserve list to cover possible renunciations and future positions.

Awardees will receive a formal invitation letter.

The following evaluation criteria will be used by the Evaluation Committee during the pre-selection phase:

Evaluation criteria	Score (points)	Sub criteria	Weight	Threshold
Academic record and CV	1-10	Academic and/or professional curriculum in relation to the stage of the candidate's career (graduate studies, grades, institution), including career breaks.	50%	60%
		Research experience (diverse fields /sectors, publications, participation in projects).		
		International mobility (studies abroad, secondments, etc.).		
		Scientific-technological quality (courses, workshops).		
		Fellowships/awards received, supervision, knowledge transfer, communication and other relevant merits.		
Motivation Letter	1-10	Strength and relevance of the candidate's motivation towards the research conducted at IRB Barcelona.	20%	50%
		Interest in any specific IRB Barcelona research group.		
Letters of reference	1-10	Reference letters supporting the candidacy will be assessed taking into account the relevance of the content and the person who signs the letter in relation to the candidate's target research groups.	30%	50%

The overall score of the pre-selection phase will be calculated by multiplying the score obtained for each criterion (1-10 points) by the weight assigned to each one (as seen in the table in %). Only applications that are above the thresholds established for all criteria will be considered. This procedure will lead to a score out of 10. A ranking will be obtained in a

consensus meeting. In case of a draw in the total score between applications, candidates will be prioritized on the basis of the weight of each criterion. If two candidates have the same scores for all evaluation the criteria, both will be invited to interviews.

During the Candidate's Presentation Panels and Interview phases, additional criteria (see below) will be taken into consideration:

Evaluation criteria	Score (points)	Sub criteria	Weight	Threshold
Candidate's potential	1–10	Ability to present complex reasoning in English.	40%	50%
		Independent thinking, creativity, and organisation capacity.		
		Leadership skills, team working capacity, and maturity.		
Motivation	1–10	Strength and relevance of motivation for applying to IRB Barcelona.	30%	50%
		Motivation towards the research lines offered by the different research clusters and/or research groups.		
Academic background and theoretical fundamentals	1–10	Suitability of the candidate's academic background to undertake the research lines offering projects in the call.	30%	50%

The overall score in the interview phase will be calculated by multiplying the score obtained for each criterion (0–10 points) by the weight assigned to each one (as seen in the table in %). This procedure will lead to a total score out of 10. A ranked list of candidates will be drawn up. In the event of a draw in the total score, candidates will be prioritized on the basis of the weight of each criterion. When scores on all evaluation criteria are still the same, preference will be given to candidates from under-represented groups (e.g. on the basis of gender, disability or refugee backgrounds).

On 9 December 2014, IRB Barcelona was awarded the "HR Excellence in Research" logo. This recognition reflects the commitment of the Institute to continuously improving its human resources policies in line with the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers. More information about our OTM-R (Open, Transparent, Merit-based Recruitment) policy can be found at the following link.

VII. Documentation

Each candidate selected during the interviews must present the following documents to complete the selection procedure.

1. Degree certificate or official notification of degree award.

Non-Spanish nationals must present: 1) a certified copy and sworn translation of the degree certificate or equivalent obtained in a university abroad; and 2) a certified copy and sworn translation of the certificate showing the subjects studied.

If the certified academic records are not in Spanish, Catalan or English applicants should also attach a sworn translation in one of the above mentioned languages.

2. A sworn statement expressing intention to enrol in a university doctoral programme.

3. A sworn statement stating that he or she does not receive any other funding or fellowship grant.

(Non-compliance with points 2 and 3 will automatically lead to withdrawal of the fellowship and the awardee must return any amounts received to IRB Barcelona).

VIII. Communication of Fellowship Award

The Head of Human Resources and Academic Affairs department will officially inform successful candidates of the fellowship award.

IX. Rights of Awardees

1. Awardees will have the following general rights:

    a) To be provided with the necessary assistance to perform their studies and research activities.
    b) To become a member of the research programme in which they will be undertaking PhD studies.
    c) To participate in bodies governing and representing the student community.
    d) To participate in complementary calls for funding to attend scientific congresses or to spend training periods in other centres upon approval of their supervisors and the director of IRB Barcelona.
    e) To have their intellectual and industrial property rights regulated in the employment contract with IRB Barcelona.

2. Awardees will have employment and Social Security rights derived from the employment contract with IRB Barcelona.

3. Awardees will be able to exercise intellectual property rights derived from their training activity in accordance with their contribution, as established in the Intellectual Property Law, Royal Decree 1/1996, 12 April. These rights will be independent, compatible, and accumulable with other rights that may arise from the research developed, without negatively affecting the rights of the joint effort when the awardees participate in or are associated with a joint research project.

4. Regarding possible industrial property rights of the awardees, these will be regulated by Law 24/2015, of July 24, 2015, on Patents, and Royal Decree 55/2002, of January 18, 2002, governing the exploitation and license of rights on discoveries made in public research organisations.

   Said rights will not be linked to salary.

X. Responsibilities of Awardees

1. To fulfil the terms and conditions established in this call.

2. To enrol in a university doctoral programme.

3. To perform their research activity under the supervision of a group leader at IRB Barcelona for the duration of the fellowship. In addition, they must perform the activities foreseen in the research training and specialisation programmes of the Institute, as well as satisfactorily fulfil the objectives of the training programme.

4. To comply with the internal regulations of IRB Barcelona, particularly regarding working conditions and the prevention of occupational risks.

5. To prepare a report each year informing on the scientific progress of their theses. Moreover, they will present this report to their Thesis Advisory Committee, designated by the Institute.

6. To request approval from the group leader supervising their activity prior to the submission for publication or disclosure of any abstracts and/or publications based on research carried out at IRB Barcelona.

7. To undertake the duties that correspond to them as a result of being contracted by IRB Barcelona, as well as those associated with inclusion in the Social Security System.

8. To defend their theses and obtain the respective PhD degree by the end of the fourth year after the start of the fellowship. In exceptional cases, an extension of one year may be given for the defence of the thesis.

XI. Termination of Fellowships

The fellowship will be revoked if the awardee has withheld or falsified information. The fellowship will also be revoked if the awardee does not fulfil the responsibilities described in point X.

XII. Incompatibility

Awardees will be devoted exclusively to the research or technical training and specialisation activities defined in this call. The fellowships included in this call are not compatible with any other type of grant or fellowship from other public or private organisations.

XIII. Legal Regime

Awardees will be subjected to the legal regime applicable to PhD fellowships according to the law in force at the time of drawing up the contract.

XIV. Data Protection

In accordance with Regulation (EU) 2016/679 (General Data Protection Regulation), Organic Law 3/2018 of December 5, and other applicable regulations governing personal data protection, any personal data provided by applicants will be incorporated into the Academic file of IRB Barcelona, for which the Institute is the data controller. The purpose of keeping such data is to manage the relationship of the Institute with applicants. Applicants may exercise the rights of access, rectification deletion, opposition, transfer and expiry, as well as limitation in data processing of said information by contacting the Institute at the following e-mail address: dataprotection@irbbarcelona.org, or by writing to the following postal address: C/ Baldiri Reixac, 10, 08028, Barcelona.

XV. Dissemination

Any information regarding this fellowship call will be placed on the announcement board on IRB Barcelona's website.

XVI. Clarification

The Director of IRB Barcelona or a designated representative will be responsible for clarifying queries regarding these terms and conditions.

Barcelona, 5 November 2025

Maribel Labrid
Head of Human Resources and Academic Affairs

ANNEX 1. Research projects

IRB Barcelona research group	Group Leader	Research Cluster	Project Title	Description of the research project
Quantitative Stem Cell Dynamics	Alejo Rodríguez-Fraticelli	Aging and Metabolism	Recording and Engineering Age-associated Epigenetic Memories in Leukemia Stem Cells	Acute myeloid leukemia (AML) disproportionately affects older individuals, yet the molecular causes of this age-related vulnerability remain poorly understood. This PhD project will investigate how lifelong inflammatory signals and epigenetic memory shape leukemia stem cell behavior and influence malignant transformation in aging hematopoiesis. The student will deploy cutting-edge clonal barcoding technologies for perturbation screens, combined with novel murine models that record in vivo inflammatory exposure. Our ultimate goal is to identify actionable therapeutic vulnerabilities that enable personalized treatments for myeloid malignancies.
Pediatric Cancer Epigenetics	Alexandra Avgustinova	Cancer Science	Gastruloids as dynamic 3D models of Ewing Sarcoma initiation	Ewing Sarcoma (EWS) is an aggressive bone and soft tissue cancer that affects predominantly children and young adults, with a peak incidence at 15 years of age. Prognosis of EWS patients is poor, with fewer than 30 % of patients surviving 5 years if their disease is metastatic at diagnosis. Identifying novel and personalised treatment strategies for EWS is therefore an undisputable and urgent clinical need. Even though different fusion oncogenes can drive EWS, EWSR1-FLI1 is by far the most prevalent translocation in patients (85-90% of cases). Molecularly, EWSR1-FLI1 triggers profound global transcriptomic and epigenomic reprogramming, yet the functional repercussions of EWSR1-FLI1 expression hugely depend on the affected cell. Oncogenesis only occurs if the affected cell has oncogenic competence, a term that refers to a molecular framework and cellular context permissive for oncogenic transformation.
Mitochondrial Biology and Tissue Regeneration	Ana Victoria Lechuga-Vieco	Aging and Metabolism	Reversing T Cell Exhaustion via Targeted Mitochondrial Nanoparticles	Mitochondrial dysfunction is a key driver of T cell exhaustion, limiting the efficacy of cancer immunotherapies. While immune checkpoint inhibitors and cytokine therapies have improved clinical outcomes, many patients fail to respond due to metabolic barriers within the tumor microenvironment. Recent findings underscore the crucial role of mitochondrial health in sustaining T cell function, as impaired oxidative phosphorylation (OXPHOS) and NAD+ depletion contribute to immune exhaustion. However, restoring mitochondrial function in exhausted T cells remains a major challenge due to the lack of targeted delivery strategies

				capable of supplying therapeutic agents to the mitochondria of T cells in a specific manner while avoiding surrounding cells that could trigger immune responses in healthy tissues. To achieve this, this project proposes an interdisciplinary approach that uniquely integrates nanomedicine, immunology, and metabolism, addressing longstanding challenges in mitochondrial immunotherapy. This project aims to develop mitochondria-targeted nanoparticles to dysfunctional mitochondria in CD8+ T cells, restoring metabolites levels and enhancing OXPHOS and ATP production. Precisely restoring T cell function at its metabolic core will strengthen their overall antitumor response.
Signalling and Cell Cycle Laboratory	Angel R. Nebreda	Cancer Science	Exploring tumor vulnerabilities by targeting stress kinase signaling	We are investigating molecular mechanisms of tumorigenesis, especially regarding how protein kinases in general, and the stress-activated p38 MAPK pathway in particular, regulate tumor development and the response to cancer therapies. Ongoing projects in the group address two main topics: (1) Cancer cell homeostasis and chemoresistance mechanisms, and (2) Cross talk between cancer cells and stromal cells. Our work combines biochemical approaches and experiments in cultured cells with studies using mouse models and chemical tools. We are performing a number of genetic and chemical screenings to find new actionable targets that can be used to boost current cancer therapies as well as to design new targeted therapies for particular tumor types. Candidates will contribute to the identification of therapeutic opportunities based on the modulation of protein kinases, either alone or in combination with other drugs.
Targeted protein degradation and drug discovery	Cristina Mayor-Ruiz	Computational, Chemical and Structural Biology	Molecular glue degraders as a generalizable therapeutic solution	At the interface of chemical biology and cancer research, our lab is interested in enabling and studying the chemical rewiring of E3 ubiquitin ligases as a therapeutic approach. Specifically, we focus on pushing the boundaries of targeted protein degradation −and in broader terms, proximity-inducing pharmacology−, as a powerful approach to widen the druggable proteome and to tackle fundamental questions of cancer and E3 biology. Our approach to science is multi-disciplinary and highly collaborative, leveraging high-throughput technologies like chemical screening, quantitative proteomics, and functional genomics. We firmly believe in the potential of "molecular glue degraders": compounds that orchestrate direct interaction between target proteins and E3 ubiquitin ligases, driving the proteasomal degradation of otherwise undruggable proteins. In this PhD project, you will help build platforms for the rational discovery of molecular glue degraders against cancer-relevant targets.

Inflammation, Tissue Plasticity & Cancer	Direna Alonso-Curbelo	Cancer Science	Functional decoding of cell–cell and niche interactions governing tumor	Our lab investigates how genetic mutations and environmental cues work together to cause malignant transformation and immune evasion, focusing on pancreatic and liver cancers—two diseases urgently in need of better strategies for early detection and treatment. Since tumor cells often hijack mechanisms essential for normal tissue homeostasis, such as wound healing, regeneration, and immunity, we combine bulk and single-cell omics methods with flexible disease models to identify molecular and cellular traits unique to tissues undergoing neoplastic transformation and metastatic progression. We then use functional genomics (RNAi/CRISPR) and synthetic biology techniques to pinpoint the specific mechanisms behind disease development and find new strategies to stop cancer progression and re-activate anti-tumor immune responses. The available PhD projects will investigate, at molecular and functional levels, how cancer driver mutations and epigenetic states influence tumor-immune interactions across local (micro) and systemic (macro) environments. Building on our recent discoveries of epigenetic mechanisms that facilitate cooperation between oncogenic mutations and tissue damage (Alonso-Curbelo et al., Nature 2021; Burdziak*, Alonso-Curbelo* et al., Science 2023), and that can be reprogrammed to activate anti-tumor immunity (Chen et al., Cancer Discovery 2023), this research offers students broad training. They will gain skills in cancer biology, functional genomics (e.g., RNAi/CRISPR), flow cytometry, cultivation of organoids, cell lines, and primary immune cells, as well as single-cell technologies, spatial analyses (immunofluorescence, immunohistochemistry), and experimental design, data analysis, and reporting. Additionally, students will collaborate with a dynamic team of cancer biologists, biotechnologists, and computational scientists to develop innovative experimental pipelines, benefit from interdisciplinary collaborations, and contribute to a stimulating and enriching research environment.
Cell Signaling	Francesc Posas & Eulàlia de Nadal	Mechanisms of Disease	Decoding cellular adaptation: From yeast to humans	Cells face constant environmental challenges and must rapidly rewire their internal circuitry to meet new demands while maintaining their identity and maximizing fitness. Failure to adapt can lead to compromised cellular function, ultimately threatening cell viability. Our lab investigates the molecular mechanisms underlying adaptive processes to stress focusing on signaling pathways and adaptive responses that govern cell fate decisions. We integrate a multidisciplinary approach, including cutting-edge proteomics, genomics, transcriptomics, and advanced single-cell technologies to decode the molecular language of cellular adaptation.

				PhD candidates will engage in innovative research across multiple fronts: discovering novel gene functions critical for stress adaptation through large-scale genetic screens (including CRISPR screens in yeast and mammalian systems); biochemically identifying novel targets regulated by stress-activated protein kinases and defining their functional impact on cellular physiology; and leveraging state-of-the-art single-cell RNA sequencing (scRNA-seq) and spatial transcriptomics to reveal heterogeneity in adaptive responses. By connecting molecular profiles to phenotypic outcomes, we aim to define novel mechanisms controlling cellular adaptation, define its role in specific pathologies and the identification of novel therapeutic strategies to address them. Join our dynamic and collaborative research environment, where you will work within a multidisciplinary team and collaborate with international partners. Through understanding how cells mount adaptive responses, we seek to unlock fundamental insights with implications for health and disease.
Microtubule organization in cell proliferation and differentiation	Jens Lüders	Mechanisms of Disease	Role of the microtubule network in building specialized cell types and tissues	The microtubule cytoskeleton provides cells with mechanical support, mediates intracellular transport, and segregates the chromosomes during cell division. These functions are crucial for cell proliferation and differentiation and thus the formation and maintenance of tissues. For example, malfunctioning of the microtubule cytoskeleton is linked to both impaired development and degeneration of the brain. This project aims to elucidate how the microtubule network is organized in induced pluripotent stem cells (iPSCs) and remodeled during differentiation to support the formation of specialized tissues such as neuroepithelium. As part of an international team, the student will address these questions using human iPSC culture, iPSC differentiation into different cell types, CRISPR-mediated genome editing, and advanced microscopic imaging techniques including super resolution microscopy.
Gene Translation Laboratory	Lluís Ribas	Aging and Metabolism	Impact of defective protein synthesis upon human aging and cancer	A degenerate proteome is a common feature of human tumors and aging tissues. In cancer, proteome variability is generally associated to aggressive tumoral growth and immune evasion. In aging, muscle frailty, sarcopenia, and neurodegeneration are directly linked and/or caused by decreased efficiency or fidelity of protein synthesis. The molecular mechanisms underlying this loss of proteome quality are not understood. We have recently reported that genes coding for a fundamental molecule in protein synthesis (tRNAs) are mutational hot spots in human tumors and healthy tissues (Murillo-Recio 2025, BioRxiv). Now we want to determine how do these

				mutant tRNAs impact human aging, what is the relative sensitivity of different tissues (in particular the brain) to this insult, what role do mutant tRNAs play in cancer and in tumor immune recognition, and what therapeutic approaches may be used to address this problem. We are open to both experimental and computational approaches to investigate this new phenomenon.
Development and Growth Control Laboratory	Marco Milán	Mechanisms of Disease	Drosophila as a model to address the impact of aneuploidy in development	Aneuploidy, an unbalanced number of chromosomes, is the main cause of miscarriages in humans, a hallmark of aging and of most solid cancers of epithelial origin, and it is related to mental retardation and microcephaly. Identifying aneuploid cells' liabilities that can be therapeutically exploited constitutes an appealing strategy to tackle this very relevant challenge for human health. In the laboratory, we are using Drosophila to mechanistically understand the deleterious effects of systemic aneuploidies (trisomies and monosomies) on organismal and organ development, and to identify the molecular elements used by normal cells to remove, through a process of cell competition, aneuploid cells from a developing organ. In order to achieve these two aims, we are combining the use of genetic engineering, genomics, proteomics and functional genetics with confocal microscopy and live imaging.
Molecular Modelling and Bioinformatics	Modesto Orozco	Computational, Chemical and Structural Biology	Studies on therapeutic nucleic acids	
Biomedical Genomics	Núria López-Bigas	Computational, Chemical and Structural Biology	Mutagenesis and selection in the evolution of normal tissues	Normal human tissues evolve through the interplay of variation (neutral mutagenesis) and selection, the same forces that shape tumorigenesis. While most mutations capable of driving a tumor in normal tissues do not lead to cancer, all adult tumors start with mutations that drive a clonal expansion in a normal tissue. In the past two decades, through the study of tumor genomes, we have deciphered new mutational processes and come close to completing the compendium of all cancer driver genes and mutations. Nevertheless, our knowledge on the very first steps of tumorigenesis is still very limited. In our lab we are approaching the question of how known cancer risk factors shape the evolution of human normal tissues using ultradeep DNA duplex sequencing (https://www.nature.com/articles/s41586-025-09521-x).

Structural Bioinformatics and Network Biology	Patrick Aloy	Computational, Chemical and Structural Biology	Blending Biology, Chemistry and AI to Enable Personalized Systems	Biological data is accumulating at an unprecedented rate, escalating the role of data-driven methods in computational drug discovery. The urge to couple biological data to cutting-edge machine learning has spurred developments in data integration and knowledge representation, especially in the form of heterogeneous, multiplex and semantically-rich biological networks. Today, thanks to the propitious rise in knowledge embedding techniques, these large and complex biological networks can be converted to a vector format that suits the majority of machine learning implementations. In this computational framework, complex connections between entities can be unveiled by means of simple arithmetic operations. Indeed, we demonstrate and experimentally validate that these descriptors can be used to reverse and mimic biological signatures of disease models and genetic perturbations in vitro and in vivo. However, only a tiny fraction of the possible chemical space has been so far explored, meaning that most compounds able to modulate biological activities (i.e. drugs) are yet to be discovered. Accordingly, the main objective of my laboratory is to couple bioactivity signatures and generative AI to design and synthesize new chemical entities (NCEs) with a desired functionality. In particular, we aim at generating NCEs to modulate the activity of a specific set of targets, selected from a combination of perturbagen profiles, to revert the pathological state induced by Alzheimer´s disease (AD) and other complex disorders. All in all, the incorporation of machine learning methods to the drug discovery process is triggering the development of thousands of novel compounds, finally enabling personalized pharmacology. References - Comajuncosa-Creus et al. Integration of diverse bioactivity data into the Chemical Checker compound universe. 2025. Nat Protocols, 1-25. - Comajuncosa-Creus et al. Comprehensive identification and characterization of druggable pockets thourgh binding site descriptors. 2024. Nat Commun. 15: 7917. - Fernández-Torras et al. Integrating and formatting biomedical data in the Bioteque, a comprehensive repository of pre-calculated knowledge graph embeddings. 2022. Nat Commun. 13: 5304. - Pauls et al. Identification and drug-induced reversion of molecular signatures of Alzheimer's disease onset and progression in AppNL-G-F, AppNL-F, and 3xTg-AD mouse models. 2021. Genome Med. 13:168. - Bertoni et al. Bioactivity descriptors for uncharacterized chemical compounds. 2021. Nat Commun. 12:3932.

				- Duran-Frigola et al. Extending the small molecule similarity principle to all levels of biology with the Chemical Checker. 2020. Nat Biotechnol. 38: 1087-1096.
Translational Control of Cell Cycle and Differentiation	Raúl Méndez	Mechanisms of Disease	A Mechanistic Approach to Chronic Stress Responses in Metabolic Liver Disease and Cancer	This project investigates the cellular and molecular mechanisms through which dietary fat consumption impairs the liver's capacity to maintain effective stress response mechanisms. We have identified several signaling pathways that may be crucial to this process and are exploring methods to therapeutically modulate these pathways. Our hypothesis is that modulating these factors may restore the liver's capacity to respond to stress and reverse the epigenetic memory induced by parental dietary fat consumption, which predisposes the liver to damage and cancer. Ultimately, this research aims to identify new therapeutic targets for treating liver cancer in aging populations with high dietary fat intake. The project employs cutting-edge multi-omic analyses—including epigenomic, epitranscriptomic, translatomic, and metabolomic profiling—in genetically modified mouse models of liver disease, along with analyses of patient samples. This comprehensive approach will enable us to characterize the molecular landscape underlying metabolic liver disease and to identify potential intervention points for therapy.
Growth Control and Cancer Metastasis	Roger Gomis	Cancer Science	Understanding metastasis drug resistance	We propose to elucidate drug-tolerant persister BCa cells, which develop following treatment, can persist in the body in a latent state, and can metastasize. We believe that there is an extensive phenotypic heterogeneity and plasticity present in BCa cells/tissues prior to treatment, which influences chemotherapy resistance and promotes resistant cancer cell development. Research has been hindered by their heterogeneity and the technical difficulties presented by the extremely low number of cells necessary for disease progression and by the requirement of an extra-cellular environment for drug resistant plasticity. We now propose to gain previously unappreciated understanding at the genetic, epigenetic, biochemical, and cellular levels of the chromatin and transcriptional regulatory mechanisms that establish drug resistant latent state and subsequent metastasis progression, and then to exploit this information for therapy.
Stem Cells and Cancer	Salvador Aznar Benitah	Aging and Metabolism		Project 1 (FPI) *Title: Targeting Metastasis to Combat Cancer-Associated Cachexia: Unraveling the Role of Host Metabolism in Metastasis and Cachexia Progression* This project aims to investigate how metastatic oral squamous cell carcinoma (SCC) contributes to cancer-associated cachexia (CAC) by exploring the systemic interactions between metastatic cells and the host beyond the primary

				tumor site (i.e., the oral cavity). Given that metastases account for over 90% of cancer-related deaths1 and that patients with advanced cancer and cachexia have limited tolerance to conventional therapies, our goal is to identify potential pathways of communication between metastases and the host, to understand cachexia at the systemic level and to potentially predict which patients will develop it. This knowledge will help to develop complementary therapies to enhance current cancer treatments and improve patient outcomes. Project 2 *Title: Epigenetic memory of liver stress responses in MAFLD: From intergenerational predisposition to therapeutic innovation* This study looks at how a mother's diet, specifically one high in a fat called palmitic acid, may affect her child's risk of developing fatty liver disease (MAFLD) later in life. Researchers are exploring if a high-fat diet during pregnancy can cause lasting changes in child's genes (through a process called "epigenetic memory") that could make the liver more likely to store excess fat, a key feature of MAFLD, and other liver metabolic alterations later in life. The study has three main goals: Understanding “Epigenetic Memory”: exploring if and how the fat from a mother's diet affects gene expression in the liver, leading to fat buildup in the liver. Human Cell Testing: using cells that mimic human liver function, the aim is to confirm the findings and explore possible treatments. Cellular Stress and Aging: Examining whether persistent cell stress in high-risk patients accelerates aging and worsens MAFLD. By looking at both animal and human cells, this research could uncover ways to prevent or treat MAFLD, especially in people who might be at higher risk due to early dietary exposures. Project 3 *Title: Overcoming immune resistance in TNBC liver metastases through epigenetic targeting* Key Questions to be addressed Why do liver metastases in advanced TNBC respond poorly to current standard-of-care therapies? Can epigenetic repression of antigen presentation be reversed to restore anti-tumor immunity in liver-dominant TNBC disease?

				This proposal aims to personalize therapy for liver-dominant TNBC by identifying robust biomarkers and reversing liver-specific immune suppression. It aligns with the imminent incorporation of sacituzumab govitecan (Trodelvy) into first-line treatment (data from our clinical collaborator from VHIO) and tackles liver-specific immune resistance—a key barrier to treatment success—aiming to improve outcomes for an underserved patient group. Notably, emerging patient-derived data link MHC-II expression to improved immunotherapy response in TNBC, supporting its use to identify patients who may benefit from precision treatment while safely avoiding toxic chemotherapy (Wang et al., 2025).
Innate Immune Biology	Stefanie Wculek	Aging and Metabolism	Harnessing the therapeutic potential of tissue-dependent (metabolic) adaptations of dendritic cells	Dendritic cells (DCs) are key to instruct immunity, inflammation and tolerance in infectious and non-infectious diseases mainly by controlling T cell responses. DCs develop in the bone marrow and subsequently colonize various organs to sense and respond to insults. Different tissues comprise highly distinct milieus that impose context-dependent biochemical challenges on their resident cells, which is further aggravated during conditions such as obesity and during aging. Yet, it is poorly known how dendritic cells survive in their different homing organs and maintain or lose their functionality in diseasesettings. We investigate how different subsets of DCs adjust to distinct environments in health and non-infectious diseases. This is important, because dysfunctional DCs can lead uncontrolled inflammation or immune- paralysis with detrimental effects for patients. Given their power to orchestrate immune responses, revealing the precise (metabolic) adaptions of DCs to changing milieus and how those impact their functionality holds high therapeutic promise. This project will uncover and characterize the relevance of context-dependent (metabolic) adjustments for the pro- or anti-inflammatory functions of DC subsets to environmental alterations (such as changes in micro-nutrient and ion availability, healthy versus obese or young versus aged tissues) and dissect the underlying molecular mechanisms. The details of the project will be designed based on the interests of the successful candidate within the research lines of the group. Independent innovative approaches and adapted cutting-edge techniques will be used for analysis of mouse models, primary tissue culture and human samples; including multicolour flow cytometry, (single-cell) RNA sequencing and proteomics, metabolomics, multiplex microscopy and spatial analyses, epigenetic analyses and various metabolic assays. The discovery of tissue-dependent adaptions by DCs that impact their functions will transform translational research to integrate the environmental context and reveal novel “innate immunotherapies” to combat non-infectious diseases such as obesity and aging.

Comparative Genomics	Toni Gabaldón	Computational, Chemical and Structural Biology	PhD in comparative genomics group	The comparative genomics group (www.cgenomics.org) is seeking motivated candidates to perform a PhD in the exciting areas of host-microbe and drug-microbe interactions, using state-of-the-art experimental and computational approaches. We are now looking for candidates with either an experimental or bioinformatics background with interest in genomics, microbiology and pathogen biology. The two lines of research that are actually developing are the following: Host and Drug Adaptation in Emerging Candida Pathogens: Investigating molecular mechanisms of virulence and antifungal resistance. Human Microbiome in Health and Disease: Unraveling complex microbial communities and their role in human health, with a current focus on the onset and progression of colorectal cancer.
Laboratory of Molecular Biophysics	Xavier Salvatella		Sequence determinants of condensate kinetic stability	Biomolecular condensates are dynamic assemblies that concentrate proteins and nucleic acids to facilitate different cellular activities. However, their high protein concentration can also promote protein aggregation into fibrillar structures, potentially disrupting these activities and compromising cellular health. The student joining our laboratory will investigate how the sequences of intrinsically disordered regions have evolved to preserve the kinetic stability of condensates against aggregation.

ANNEX 2. Evaluation criteria

1. Academic and/or scientific-technical trajectory of the candidate (up to 50 points).

Sub-criterion 1.a): Scientific-technical contributions (up to 45 points). The candidate's academic record and other curricular merits will be assessed, as well as their suitability for the tasks to be performed based on their training and professional experience.

Sub-criterion 1.b): Mobility and internationalisation (up to 5 points). The relevance and impact on the candidate's research trajectory of stays at national and international centres and/or in the industrial sector will be assessed, taking into account the prestige of the host institution and the activities carried out during the stay.

2. Suitability of the candidate for the research activities to be conducted (up to 50 points).

The candidate's suitability for the program, project, or research activities to be carried out will be assessed based on their prior education and experience. This assessment will take into account the added value that the completion of the project will bring to their research career, as well as the value contributed to the hosting institution and team.