2025 Annual Report

IRB BARCELONA

Research

In 2025, IRB Barcelona has revealed how cells evolve and adapt in health and disease, from cancer initiation to ageing. Using experimental and computational approaches, we have shown how internal states and the environment shape disease, advancing knowledge for biomedical innovation.

150
Total publications

91%
Q1 Publications

76%
D1 Publications

DNA Barcodes Track Blood Age

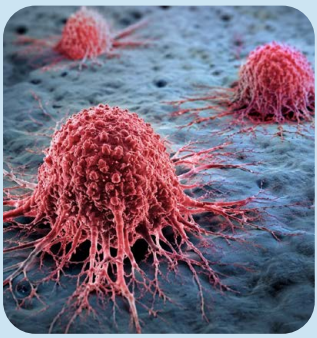
Natural DNA methylation patterns act as barcodes, tracing blood stem cell history and ageing. The study shows that from around age 50, a few stem cell clones dominate blood production, reducing diversity, increasing disease risk and explaining age-related inflammation. These barcodes open new avenues for earlier detection and therapies.

Published in *Nature*

Advanced Cell Therapy for Childhood Cancers

A study has identified immune cells with strong anti-tumour activity in aggressive paediatric rhabdoid tumour. The findings stem from an in-depth analysis of a single patient followed over time using advanced sequencing technologies. The findings help explain the patient's sustained remission and open new directions for designing tailored immunotherapies.

Published in *Annals of Oncology*



Plasticity in Cancer Resistance

Findings show metastatic colorectal cancers resist KRAS-targeted therapies by shifting between cellular states under treatment pressure. Tumour cells display strong transcriptional plasticity, transitioning into a stem-like LGR5⁺ state when KRAS is blocked, enabling survival and drug evasion, thus pointing to combination strategies for more durable responses.

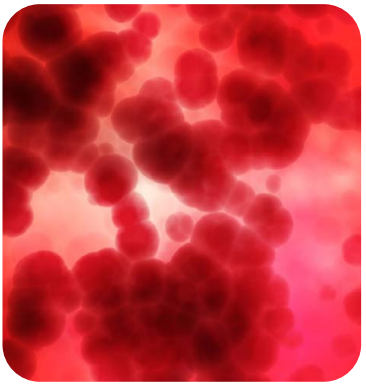
Published in *Cancer Discovery*

Research

Dual Barrier Blocks Immunotherapy

Metastatic colorectal tumours resist immunotherapy through a TGF-β-driven dual barrier that limits T-cell infiltration and weakens the activity of infiltrating T cells. TGF-β also reshapes macrophages to produce osteopontin, further suppressing anti-tumour immunity, explaining poor responses and highlighting opportunities for combination treatments to overcome resistance.

Published in *Nature Genetics*



The state of the stem cell determines the type of leukemia

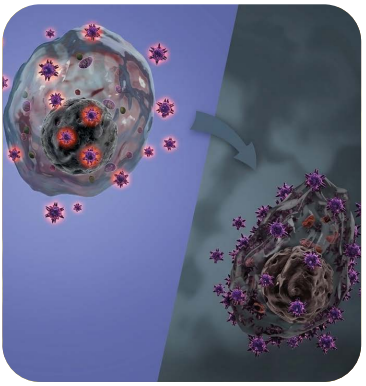
Identical cancer-driving mutations can give rise to different leukemia types depending on the pre-existing state of blood stem cells. Using lineage tracing, the study shows that intrinsic cellular properties, influence how mutated cells behave and shape disease trajectory. The findings suggest that therapies should consider not only genetic mutations, but also the cellular context in which they arise.

Published in *Cell Stem Cell*

Activating Brown Fat Against Obesity

Activating brown adipose tissue via Neuritin 1 increases energy expenditure and protects against obesity in animal models. The study shows that Neuritin 1 enhances mitochondrial activity and thermogenesis without altering food intake, leading to reduced weight gain, improved insulin sensitivity, and lower liver inflammation.

Published in *Nature Communications*



Diversity of Cell Stress Responses

Two complementary studies show how genetically identical cells use distinct strategies to respond to stress. The work reveals that individual cells activate different combinations of stress-response genes, creating diverse states; some pre-activate stress programmes, while others respond only upon exposure, generating heterogeneity that improves adaptation and survival.

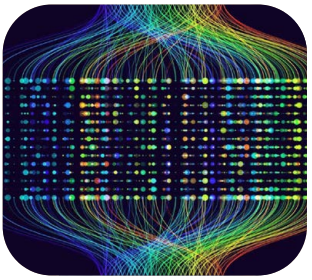
Published in *Nature Communications*

Scientific Projects

IRB Barcelona has secured competitive funding from national and international organizations including La Caixa, BBVA, AECC and FERO foundations.

FLKXA backs rare disease research

Dr. Maria Macias has received funding to develop new therapeutic strategies for Myhre syndrome. Her project advances translational research combining molecular biology and disease modelling to better understand disease mechanisms and support the development of future treatments for this rare, currently incurable pediatric genetic disorder.



FBBVA Supports Protein Disorder Research

Dr. Xavier Salvatella and Dr. Michael Krieg (ICFO) have received funding to study intrinsically disordered proteins in neuronal cells. The project investigates how pH regulates their assembly and activity, revealing transient structures that influence brain function and may contribute to neurodegeneration and cancer.

Two international colorectal cancer projects

Dr. Eduard Batlle drives two international initiatives: one studying immunotherapy resistance in metastatic colorectal cancer through tumour immune microenvironment analysis (ASPIRE grant), and CRC-STARS, which uses single-cell technologies and clinical data to map tumour evolution and heterogeneity to improve treatment strategies.

FERO Funds Breast Cancer Research

Dr. Ángel R. Nebreda has received a research grant to study triple-negative breast cancer, focusing on how tumour cells survive chemotherapy and gain metastatic capacity. The project uses single-cell technologies and experimental tumour models to track disease progression and identify mechanisms of resistance and new therapeutic targets.

AECC Funds IRB Barcelona Cancer Research

The Asociación Contra el Cáncer has allocated more than €2.4 million to five competitive research projects at IRB Barcelona, including a major coordinated grant led by Dr. Roger Gomis focused on metastasis and therapeutic resistance, and other projects led by Drs. Francesc Posas, Cristina Mayor-Ruiz, María Teresa Blasco, and Ana Domostegui.

Innovation

IRB Barcelona's innovation ecosystem has advanced the clinical adoption of the MAF Test for breast cancer, among other achievements.

6
Active spin-offs

2
Priority patent applications and extensions

19
Research Agreements with public and private entities

11
New technologies scouted

Clinical Adoption of MAF Test
The MAF Test, developed by IRB Barcelona spin-off Inbiomotion, is being implemented in leading hospitals in Barcelona and Madrid to guide treatment in early-stage breast cancer. It helps identify patients at higher risk of metastasis and those who may benefit from adjuvant bisphosphonate treatment.

Barcelona Biotech Ecosystem Recognized. *Nature* has featured IRB Barcelona spin-offs Ona Therapeutics and Nuage Therapeutics in a report on Barcelona's rise as a biotech hub. The coverage highlights the translation of academic research into oncology, drug discovery, and gene therapy, reflecting the Institute's role in entrepreneurship and technology transfer.

Nuage Advances Precision Therapies. Nuage Therapeutics, co-founded by Drs. Xavier Salvatella, Mateusz Biesaga, and Denes Hnisz (Max Planck Institute), has secured €1.8 million from CDTI Innovation, with additional EIT Health support, to advance its oncology pipeline, developing small molecules against intrinsically disordered proteins in difficult-to-treat cancers.

People & Talent

29
Research Groups

9
Core Facilities

60% Female
40% Male

511
Total members

81
Administration

430
Scientific Staff

47
Core Facilities

383
Research Programmes

Major Recognitions for IRB Barcelona Researchers. Dr. Núria López-Bigas received the Rei Jaume I Prize and Constantes y Vitales Award for cancer genomics research. Dr. Alejo Rodríguez-Fraticelli was named an EMBO Young Investigator. Drs. Carla García Cabau and Anna Bartomeu received the Pfizer Foundation Award and the Vanguardia Science Award for work on the molecular mechanisms underlying autism.

IRB-Drive – New Doctoral Programme. IRB Barcelona has secured €1.58 million from the European Union for a doctoral programme training international PhD researchers through interdisciplinary biomedical research, combining basic and translational science, fostering cross-sector collaboration, and developing skills for complex disease research.

Barcelona BioMed Conferences. Pediatric Cancer & AI. The 43rd Barcelona BioMed Conference, organized by Drs. Patrick Aloy and Trey Ideker (UC San Diego, US), explored artificial intelligence in biomedicine, while the 44th, organized by Drs. Alexandra Avgustinova, Cayetano González, and Jaume Mora (PCCB, Hospital Sant Joan de Déu), examined developmental processes in childhood cancer.

Funding

€14.6M
Core funding
(Catalan Government)

35%

€26.5M
External funding

65%

88%
of all expenses devoted to research

234
Ongoing National and International research projects and networks

Communication & Fundraising

6,182
Participants in outreach activities

€5.1M
Raised since the beginning of the Metastasis Challenge

2,940
Media impacts

Thank you!

TRUSTEES

Generalitat de Catalunya
Departament de Recerca i Universitats

Generalitat de Catalunya
Departament de Salut

Universitat de Barcelona

Fundación BBVA

CENTRE

CERCA Centres de Recerca de Catalunya

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fundación científica asociación española contra el cáncer

WITH THE COLLABORATION OF

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Ministerio de Ciencia, Innovación y Universidades · Agencia Estatal de Investigación

ICREA

Fundación "la Caixa"

Our heartfelt gratitude goes to the scientists, staff, donors, collaborators, and partner institutions whose passion and commitment made 2025 a year of breakthrough achievements.

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