



IRB
BARCELONA

INSTITUTE
FOR RESEARCH
IN BIOMEDICINE



Annual Report Summary 2018



2018

A year of changes

This year has marked a transition for IRB Barcelona. It has been a year in which Joan Guinovart has passed the directorship to me—a position that I am honoured to hold.

The annual report reflects on IRB Barcelona's achievements and it also provides an opportunity for me to acknowledge Joan's leadership over the years. During this time, we have produced significant scientific results and made important institutional accomplishments. However, I believe that the most relevant achievement has been the consolidation of such an outstanding community. This truly devoted group of people has made IRB Barcelona what it is today, namely a model of excellence in fundamental biomedical research.

In 2018, we have continued to excel in science, publishing 180 papers, some in journals such as *Nature*, *Cell*, and *Cancer Cell*, among other renowned journals—a clear reflection of our capacity. In this regard, our research has made the most impact in the following fields: cancer and metastasis; aging; autism; computational biology and the biological mechanisms of disease.

On the international front, we have continued to channel efforts into increasing our presence through flagship European projects and maintaining our leadership in science and innovation. The ERC awarded Salvador Aznar Benitah an Advanced Grant, and Fran Supek was appointed ICREA Research Professor. The work of other members of our faculty has also been acknowledged through prizes and recognitions, such as the Severo Ochoa Award given to Manuel Serrano and the Olof Palme medal presented to Eduard Batlle.

In addition, numerous outreach initiatives have been organised over the year in pursuit of our goal to build a strong relationship with the public and thus to effectively bring science closer to society. Outstanding examples of such activities include the Tandem Project, the Crazy Programme and the Metastasis Challenge.

Furthermore, this year our Administration team has undergone its first external evaluation by an international panel of experts. The panel validated the fine work done by the team and put forward some specific recommendations to increase its efficacy and thus further contribute to bringing our science and institute to the next level.

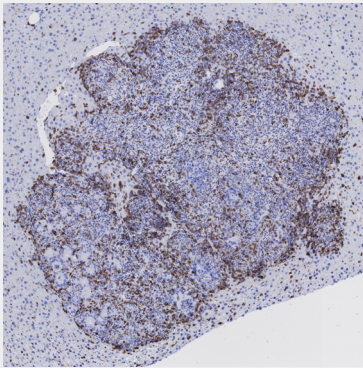
In summary, we are in prime shape to tackle the challenges that lie ahead and to keep working towards a world without disease.

Francesc Posas

IRB Barcelona Director (2018 - Present)

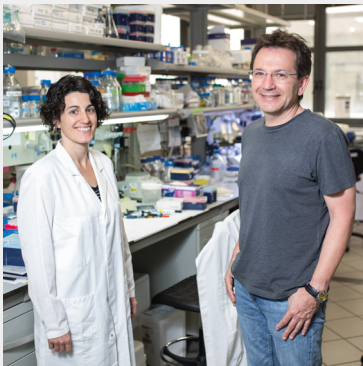
Discoveries

In 2018 we delivered on high quality scientific results. In this regard, we produced 180 papers, which were published in top-ranking journals, thus reflecting the increasing quality and impact of our research activities. We have excelled in the fields of cancer and metastasis, aging, autism, computational biology and the biological mechanisms of disease.



IRB Barcelona paves the way to the use of immunotherapy to treat aggressive colon tumours and their metastasis

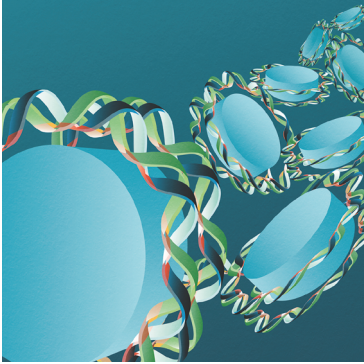
A team headed by ICREA researcher Eduard Batlle discovers that immune system-stimulating treatments combined with a TGF-beta inhibitor are effective against colon cancer. The scientists developed a mouse model that mimics advanced human colon cancer. This model has allowed them to study the immune system response for the first time.



Discovery of a key protein involved in the development of autism

The protein CPEB4, which coordinates the expression of hundreds of genes required for neuronal activity, is altered in the brains of individuals with autism. Published in Nature, the study indicated that a defect in CPEB4 could be the link between environmental factors that alter brain development and the genes that determine susceptibility to autism.

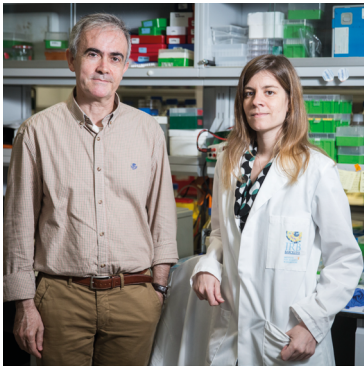
Raúl Méndez and Eulàlia Belloc from the Translational Control of Cell Cycle and Differentiation Lab at IRB Barcelona



Researchers at IRB Barcelona explain the origin of the mysterious periodicity of the genome

The team headed by Núria López-Bigas published an article in *Cell* about what might have favoured the periodicity of certain base pairs in the genomes of eukaryotic organisms. The structure adopted by DNA when packaged inside cells influences the periodicity observed.

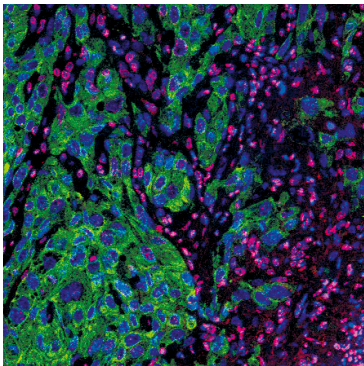
The DNA molecule, formed by a double helix, winds around histone molecules twice, thus forming nucleosomes. The pink regions indicate those enriched in Adenine/Thymine base pairs (Author: Iris Joval Granollers)



Tumour cells evade death through in extremis DNA repair

A study on breast cancer conducted at IRB Barcelona identified the key role of p38 in safeguarding tumour cells against the excessive accumulation of DNA damage, which would otherwise cause cell death. p38 blockage has been shown to increase the death of tumour cells, thus causing tumours to shrink.

Group Leader Angel R. Nebreda and PhD student Begoña Cánovas at the Signalling and Cell Cycle Laboratory (M. Minocri, IRB Barcelona)

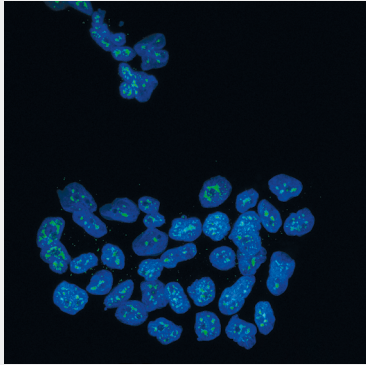


A study suggests that epigenetic treatments could trigger the development of aggressive tumours

A team headed by ICREA researchers Salvador Aznar Benitah and Fran Supek concluded that care should be taken with drugs that inhibit epigenetic factors. Published in *Nature Cell Biology*, the study was a collaboration between a biomedical lab and a computational lab at IRB Barcelona.

A invasive front of highly aggressive tumour cells (in green). Confocal microscopy image. Alexandra Avgustinova, IRB Barcelona.

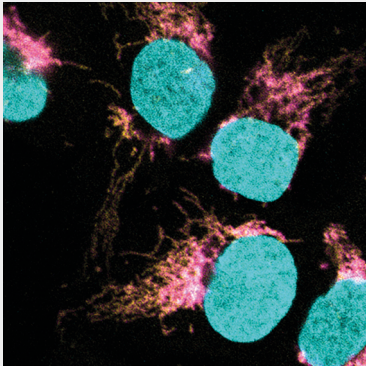
Discoveries



Researchers identify a protein that keeps metastatic breast cancer cells dormant

A team of scientists headed by Roger Gomis revealed one of the mechanisms that allows metastatic cells to leave a latent state.

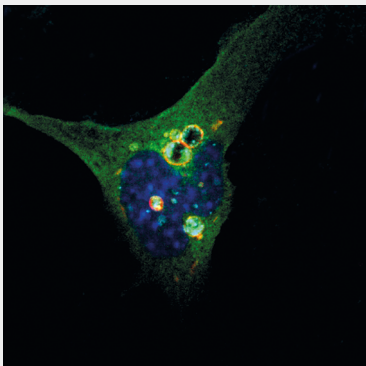
Nuclei of metastatic breast cancer cells showing the protein MSK1 in green (Author: Cristina Figueras-Puig, IRB Barcelona)



Key player in cell metabolism identified

Published in *Nature Cell Biology*, the study showed that the EXD2 protein is critical for the mitochondria, the cell's powerhouses, to produce energy. This protein was previously thought to be located in the cell nucleus and to be involved in DNA repair. The results contribute to our basic understanding of mitochondria and suggested that EXD2 could be important for fertility and represent a potential target for cancer therapy.

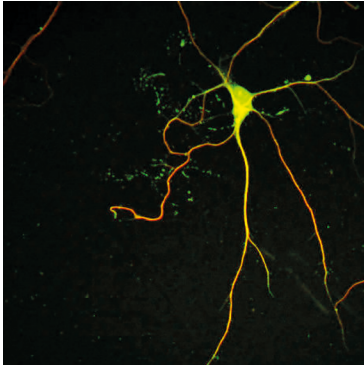
Confocal microscopy shows co-localization of EXD2 (magenta) with the mitochondrial ribosome (yellow). DNA is stained to define the nucleus (cyan)



DOR protein deficiency favours the development of obesity

Researchers led by Antonio Zorzano discovered the mechanism that leads to a less harmful form of obesity associated with the number rather than the volume of fat cells. There are several types of obesity and some are more harmful than others. The study was published in the journal *Nature Cell Biology*.

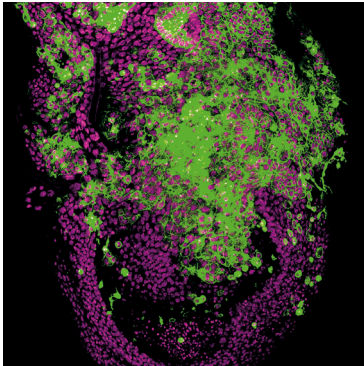
Mouse cells with DOR protein. (M. Romero, IRB Barcelona)



New regulator of neuron formation identified

Jens Lüders' team demonstrated that the protein NEK7 is relevant for the correct formation of neurons in the hippocampus, a region of the brain associated with memory. Animals without NEK7 may also have defects in other brain regions.

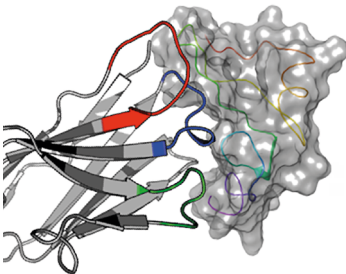
The picture shows a cultured neuron stained with antibodies that label microtubules. NEK7 promotes the stability of the dendritic microtubules, which is important for proper dendrite growth and branching (F Freixo, IRB Barcelona)



A study using Drosophila sheds light on the metastatic behaviour of human tumours

A study led by ICREA researcher Marco Milán and published in *Developmental Cell* demonstrated that chromosomal instability itself promotes invasive behaviour. The researchers identified the oncogene Fos and the tumour suppressor Capicua as necessary molecular elements mediating this invasive behaviour.

Drosophila epithelium subjected to chromosomal instability (CIN): cells start invading the neighbouring tissues. Magenta labels the nuclei of all the epithelium while green labels the membranes of cells subjected to CIN (L Barrio, IRB Barcelona)



The immune system of the alpaca reveals a potential treatment for cancer

A study by researchers at IRB Barcelona and the Vrije Universiteit Brussel identified camelid nanobodies able to block EGF, a protein that is abundant in tumour cells and that helps them to proliferate.

Figure showing the binding of a nanobody derived from alpaca to the EGF protein. The scientists demonstrate the high affinity and selectivity of a family of nanobodies for EGF, target of interest for the treatment of cancer (S Guardiola, IRB Barcelona)

Institutional Highlights



NEW DIRECTOR

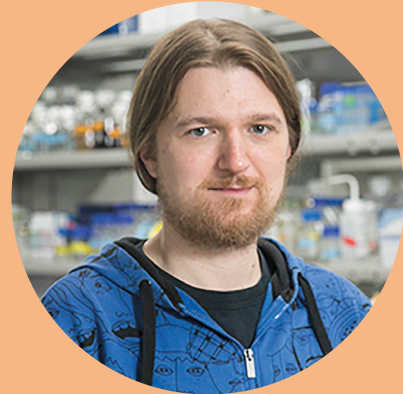
Francesc Posas was named new director of IRB Barcelona and his lab, 'Posas de Nadal', joined the institute

Francesc Posas succeeded Joan J. Guinovart, the director and founder of the Institute. Furthermore, Francesc Posas is also Group Leader of the 'Posas de Nadal' Lab.

ICREA

Fran Supek, new ICREA researcher at IRB Barcelona

Since 2017, the Croatian researcher has been leading a team of 10 scientists in the Genome Data Science Lab. With Supek's new appointment, IRB Barcelona now has 14 ICREA researchers.



4 ERC

An ERC Proof of Concept grant to fight drug resistance in breast cancer

Modesto Orozco was granted 150,000 euros to optimise and validate a promising anti-tumour therapeutic tool over 18 months.



4 ERC

Two ERC Proof of Concept grants to tackle colon cancer and cardiotoxicity

IRB Barcelona was awarded two ERC PoC grants to optimise and validate tools with potential clinical applications. Angel R. Nebreda's project seeks to develop treatments to reduce the cardiotoxicity caused by chemotherapy. Eduard Batlle's project will build a biobank of mouse tumour organoids with the aim to contribute to the treatment of patients with advanced colon cancer.



4 ERC

Salvador Aznar Benitah received an ERC Advanced Grant to study the influence of diet on metastasis

Advanced Grants from the European Research Council (ERC) support researchers who have made important scientific achievements in the last 10 years. The ICREA researcher at IRB Barcelona was granted €2.5 M to continue his studies on the effects of diet on metastasis. With this new award, the centre now holds 14 grants from the ERC.



Institutional Highlights



3 AECC

3 AECC Projects granted

Eduard Batlle, Roger Gomis, Marta Kovatcheva, Angel R. Nebreda and Francesc Posas were awarded AECC grants. They will undertake studies focused on colon, prostate, lung, melanoma and breast cancer, respectively.

AWARDS

Manuel Serrano received the Severo Ochoa Award from the Ferrer Research Foundation

Sergi Ferrer-Salat, president of the Board of Trustees of the Ferrer Research Foundation, highlighted that the work done by IRB Barcelona scientist Manuel Serrano is helping to further our understanding of the relation between ageing and to cancer and identify approaches to manipulate this relation to our advantage.



AWARDS

Eduard Batlle received a distinction from the Fundació Internacional Olof Palme

Eduard Batlle, head of the Colorectal Cancer Lab was awarded the Olof Palme Medal in recognition of his recent discovery regarding the treatment of advanced-stage colon tumors with immunotherapy.

ENABLE

ENABLE (PhD Symposium in Copenhagen)

The 2nd ENABLE European PhD and Postdoc Symposium “The promise of future medicine: from research to therapy”, hosted on 7-9 November 2018 in Copenhagen, gathered more than 250 young researchers from more than 20 countries and was a big success. The symposium was organised within the EU-funded project ENABLE, which is coordinated by IRB Barcelona. IRB Barcelona, three other European Research institutions and a communications agency organise this three-day event every year. The programme of activities includes talks by top speakers, career development opportunities and outreach activities for kids and the general public.



1ST ADMINISTRATION EVALUATION

Administration team on board with excellence

A peer review involves the evaluation of someone’s professional performance or quality of work by experts in the same field. It’s commonly used in science as way to maintain standards, improve performance, and provide credibility. In line with its commitment to continuous improvement, IRB Barcelona has recently extended this good practice to its Administration team.

TANDEM

Greater use of the scientific method to enhance learning

The Montserrat School, IRB Barcelona, and the Fundació Catalunya La Pedrera took stock of their 3-year joint project which has brought about a change in the teaching method at this primary school.



Facts & Figures

Publications



180
Publications

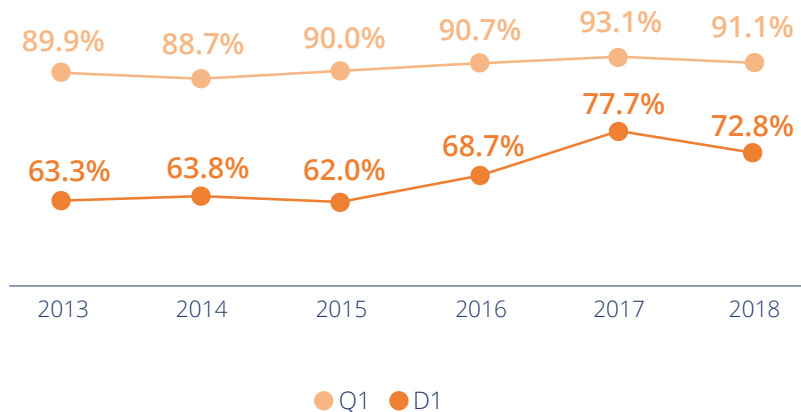


91,11%
Q1 Publications
SJR 2018



72,78%
D1 Publications
SJR 2018

Trends in Q1/D1 since 2013



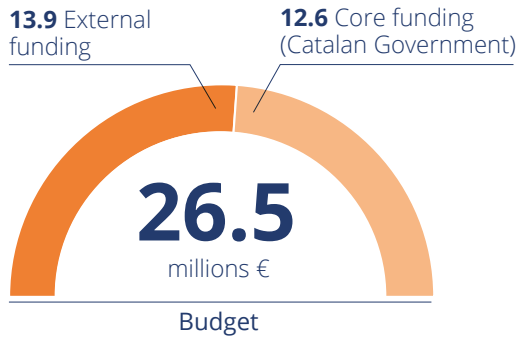
Funding

169

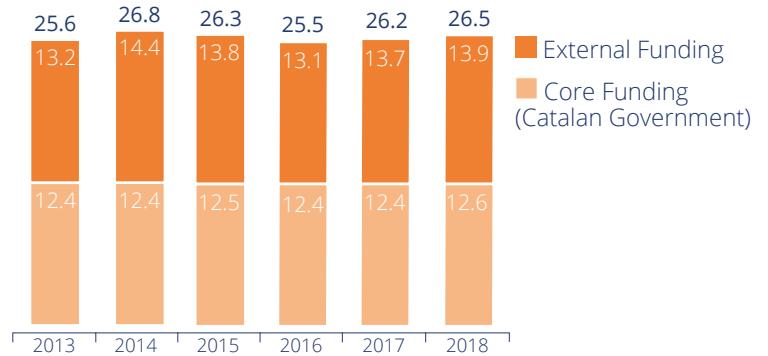
National and international research projects and networks



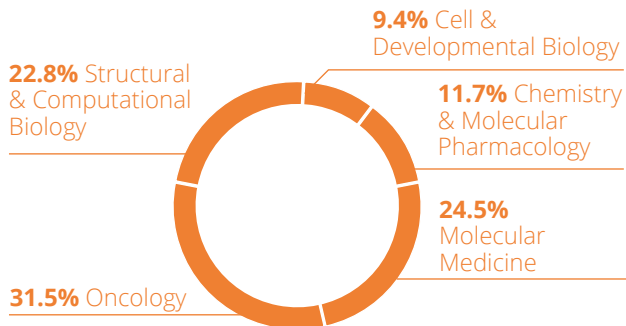
2018 Budget



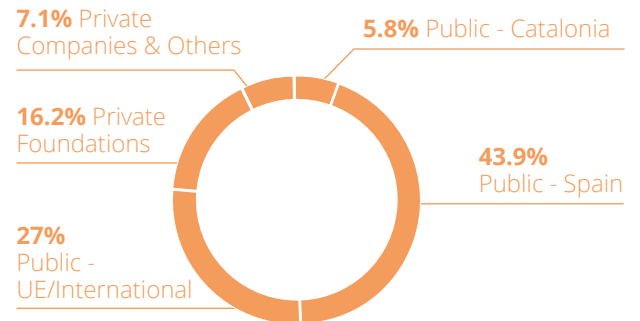
Running budget since 2013



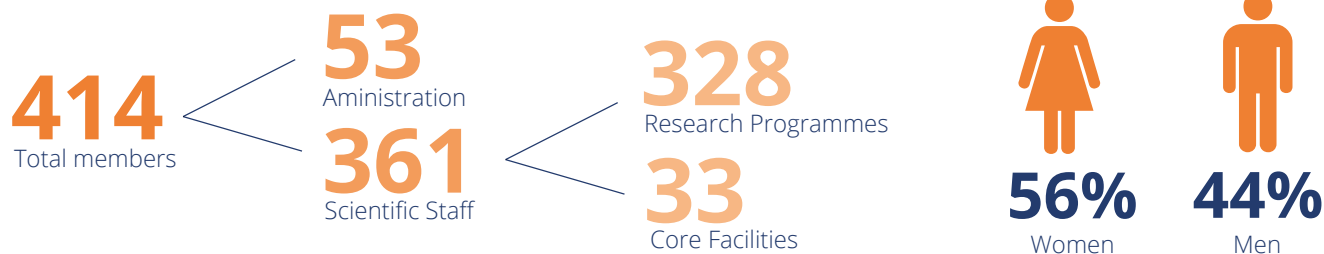
External Funding by Source



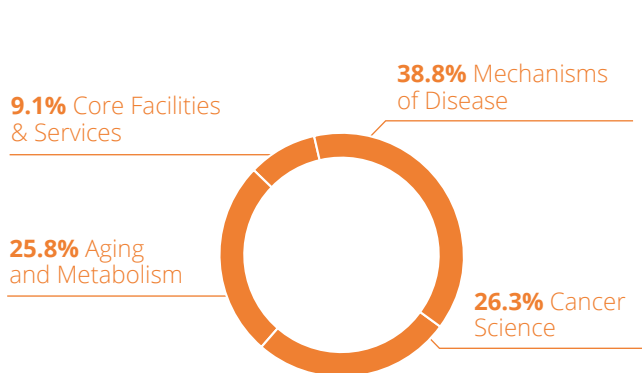
External Funding by Research Area



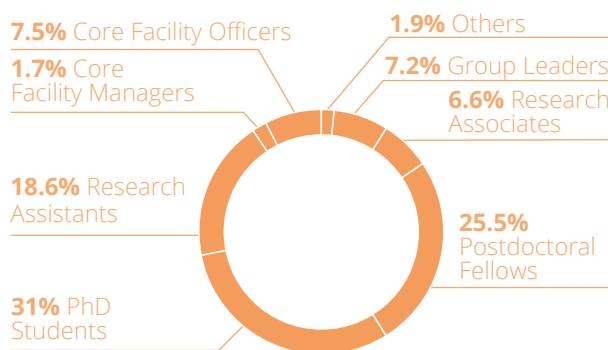
Staff



Scientific Staff by Research Area



Scientific Staff by Professional Category



Innovation



Training and scientific events

21

PhD theses defended

2

Undergraduate
training programmes

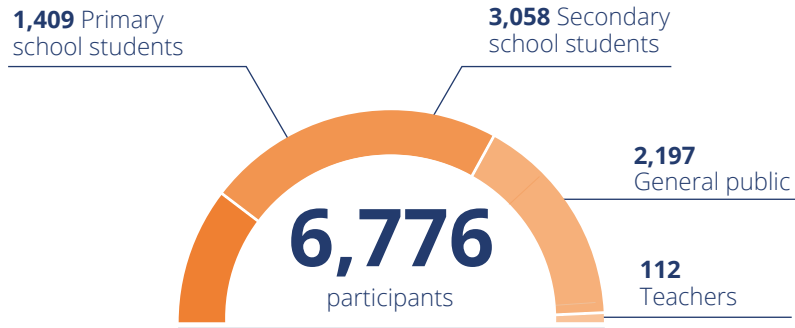
125

Barcelona Biomed
Seminars

1546

Researchers attended our
scientific conferences

Public Engagement & Science Education

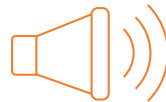


Press & Social Media & web*



Press releases

68



Media impacts
(Spain, print & digital media)

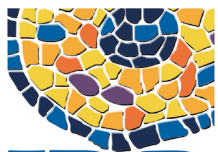
2,140



Million Impressions

>740

*Data from December 2018



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