

2019

2020

# CNBREPORT

RESEARCH\_DEVELOPMENT\_INNOVATION

2019  
2020

**CNB**REPORT  
RESEARCH\_DEVELOPMENT\_INNOVATION



**DIRECTOR 2020**  
**Mario Mellado**



**DIRECTOR 2019**  
**Fernando Rojo**

## Welcome to the CNB

This report summarises the activities of the CNB-CSIC (Centro Nacional de Biotecnología) through the years 2019 and 2020, a period marked by the SARS-CoV-2 pandemic. The infection caused by this coronavirus has been a great challenge for all scientists around the world, not least for the scientific groups of our Institute.

Taking advantage of their expertise, many CNB scientists have adapted their research activities to provide a rapid response to the society. As a consequence, the Institute has positioned itself at the forefront of the Spanish research against the virus. It is in the nature of a biotechnology centre to rapidly translate new knowledge into useful products for the society; since March 2020, the CNB has made an enormous collaborative effort and has increased its interactions with biotechnology companies to fulfil this commitment.

Our contributions against SARS-CoV-2 have been organised into seven lines of work:

1. Vaccine development. Two out of the three CSIC vaccines are being developed at the CNB, with very promising results.
2. Screening of antiviral compounds. A comprehensive analysis of drug repositioning has been performed and both newly synthesised compounds and natural extracts have been evaluated.
3. Development of neutralising recombinant antibodies against SARS-CoV-2 for therapeutic use.
4. Development of diagnostic kits both to analyse the presence of viruses in biological samples and to detect antibodies in the serum of patients.
5. Structural studies of viral proteins to identify potential therapeutic targets, as well as the effect of new SARS-CoV-2 mutations on viral infection.
6. Computational models to evaluate the effect of non-pharmaceutical measures and the behaviour of the population in the spread of epidemics.
7. Communicate our current knowledge on SARS-CoV2 both to scientists and to the general public.

This complex but coordinated network is already delivering tangible results. One of the vaccine prototypes is close to entering a clinical trial, while we are completing the generation of a second vaccine; we have launched a highly efficient seroprevalence diagnostic kit, and we have created a hub platform for scientists worldwide to access the information generated on the structure of several SARS-CoV-2 proteins. This report includes a specific section where we highlight all the SARS-CoV-2 projects underway at the CNB and the main results obtained to date.

During these two years, and as part of objectives of the Severo Ochoa Project, we have created the CNB Bioimaging platform. The main idea behind this initiative was to strengthen the Institute's bioimaging capabilities and capitalise on the recent acquisition

of advanced electron and light microscopy equipment through new lines of research that exploit the power of integrative and correlative bioimaging techniques. The Instruct Image Processing Centre (I2PC), hosted at the Institute for several years, is thus complemented with the acquisition of state-of-the-art equipment in the fields of cryomicroscopy, correlative microscopy and super-resolution microscopy, and with the development of a new Bioimaging Data Analysis Unit. Our goal now is to integrate all of these efforts to carry out multi-scale, multi-resolution approaches spanning from general anatomy to the single-cell, molecular and atomic scales.

Over the course of 2019 and 2020, CNB groups have contributed to the publication of 467 papers in ISI-listed journals, with an average impact factor of 6. Significantly, 220 of these publications made it to the top 10% of most cited journals. As proof of their dynamism, CNB researchers obtained 75 grants (14 from international agencies), submitted 63 PhD theses, taught more than 3000 hours in Master's degree programs, hosted around 170 seminars, including about 20 webinars in 2020, and organised over 50 international workshops and meetings. The data speak for themselves of the international nature of the CNB; near 58% of the papers published by our scientists are the result of collaborations with international scientific groups. As a result, the CNB is attractive to young scientists from abroad, who currently constitute 10.1% of the pre- and post-doctoral personnel. The INPhINIT initiative by the Fundación La Caixa and the Ministry of Science and Innovation, that we wholeheartedly acknowledge, has been fundamental in this regard, by offering fellowships for international and national PhD students to carry out their thesis projects at the CNB. As a result of the 2019 and 2020 calls, the CNB was selected by 57 excellent students from all over the world to start their doctoral studies at the centre.

We have also made an important effort to strengthen the biotechnological value of the CNB. In this period of time, we have initiated the procedures for 14 patents and 4 licenses to companies so that our research eventually translates into a better quality of life for citizens.

These two years have witnessed an enormous effort in the development of outreach activities and increasing our communications with society. The blog launched in our web site is up and running, our social media accounts have over 4,500 followers in Facebook and 23,500 followers in Twitter and our scientists have been featured more than 2000 times in the media. Although the annual programme of guided visits to the centre have been put on hold due to the pandemic, in the last two years we have participated in outreach events such as the European Researcher's Night, the National Science and Technology Week and the 100xCiencia meetings of SOMMA – the alliance of the Severo Ochoa- and María de Maeztu-accredited Centres.

We would like to express our gratitude to the agencies and institutions that have funded CNB research in the last two years, especially the Spanish Ministry of Science and Innovation and the European Commission which, among others, cofinanced the acquisition of the infrastructure in cryoelectron microscopy and cryocorrelative microscopy (8M€). We are also indebted to the Spanish National Research Council (CSIC) for its continuous support, and we would especially like to acknowledge the generous donations from companies and anonymous people who have contributed to supporting our projects against SARS-CoV-2 during the past year 2020.

Finally, we would also like to express our admiration and gratitude to all CNB personnel who, through their excellent work and commitment, contribute to keep our Institute running and moving forward, even in very difficult times, towards the accomplishment of our objectives.

Mario Mellado  
*Director 2020*

Fernando Rojo  
*Director 2019*