



**“Surely 2021 will be remembered as the year of the vaccines against COVID-19, powerful tools that have set a new scenario in the evolution of the pandemic, bringing profound changes in the way we are dealing with the disease at every level.”**

MARIA A. BLASCO  
Director

## FOREWORD

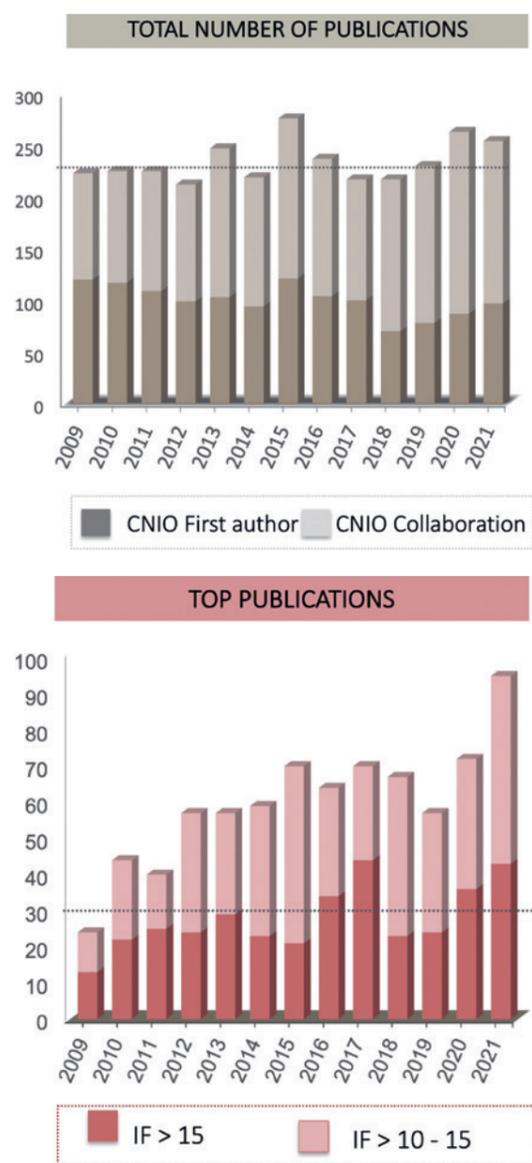
**Maria A. Blasco** Director

Surely 2021 will be remembered as the year of the vaccines against COVID-19, powerful tools that have set a new scenario in the evolution of the pandemic, bringing profound changes in the way we are dealing with the disease at every level, in the workplace as well as in our daily life.

In 2021, CNIO researchers authored a total of 254 papers, 52 of which were published in journals with an impact factor between 10 and 15, and 43 publications in journals with an impact factor greater than 15. Therefore, this year was very productive in terms of the number of high-quality publications, which increased by 32% with respect to 2020. According to the *Nature Index*, considering our scientific contributions in the life sciences and healthcare field, the CNIO ranked second among cancer-focused institutions in Europe and holds the eighth position worldwide. These indicators provide a clear evidence of the success of our scientific efforts in basic and translational cancer research.

Our contribution to the fight against the COVID-19 pandemic continued this year through several Groups and Units at the Centre who are involved in projects focusing on different aspects, including the generation of humanised mouse models susceptible to SARS-CoV-2 infection; study of the role of short telomeres in the severity and sequelae of the Covid-19 disease; the identification of genetic variants correlated with disease severity; the development of a new diagnostic method using phi29 polymerase amplification; and the evaluation of drugs that can modulate the cytokine storm associated to SARS-CoV-2 infection. Obviously, the expertise in the study of the molecular and cellular mechanisms of biology can be useful not only to address cancer related issues, but other diseases as well.

Adapting the Centre to the constant evolution of science and the new emerging fields in cancer research, by recruiting new groups working at the forefront of science, is key to maintaining our competitive edge. Thus, in January 2021 a new Research Group joined the Molecular Oncology Programme, the Cancer Immunity Group, led by Maria Casanova, coming from the



Icahn School of Medicine at Mount Sinai Hospital, New York. This new Junior Group will contribute to boosting the activity of the CNIO in the immuno-oncology area.

On the other hand, as a consequence of the application of the internal policy related to the career development of the Junior Group Leaders at CNIO, which sets a limit of 8 years for their stay at the CNIO, Massimo Squatrito, Leader of the CNIO Seve-Ballesteros Foundation Brain Tumours Group, left the CNIO in October 2021 to join AstraZeneca in Cambridge (UK) as Associate Director Translational Medicine. After his successful stay at the CNIO where he made important contributions to the understanding of the biology of brain tumours and published in high impact journals, Massimo will continue his scientific career with an executive position in a multinational pharmaceutical company. We wish him the best of luck for his professional career in the future.

Upon the retirement of Javier Benitez, the Director of the Human Cancer Genetics Programme in 2020, an international search was launched for a new director to lead a new Cancer Genomics Programme. The new programme will incorporate the Groups and Units from the former programme, together with other Groups that use biocomputational tools for the study of cancer, currently under the Structural Biology Programme. This area has the support of Raúl Rabadán, Professor in the Department of Systems Biology and Biomedical Informatics and Director of the Center for Topology of Cancer Evolution and Heterogeneity of Columbia University (New York, USA). In July 2021, Raúl was appointed as Adjunct Professor at the CNIO, an honorary appointment that allows him to maintain an official link with the Centre, reinforcing the presence of the CNIO in the field of computational biology approaches to cancer research.

In 2021, a new Head of the Familial Cancer Clinical Unit joined the CNIO, after the retirement of Miguel Urioste. We thank him for his dedication and placing the CNIO as a reference in the field of familial cancer genetic diagnostics. The new Head, Maria Currás, is an M.D./Ph.D. with a strong background in clinical genetics, who moved from the *Clínica Universitaria de Navarra* in Madrid to the CNIO in January 2022.

The relevance and broad scope of our innovation activities represent another meaningful indicator of the social impact of our scientific activities. In June 2021, a new Director of the Innovation Area joined the CNIO, after an international search put in place upon the departure of the previous director in 2020. The new Director, Roke Iñaki Oruezabal, was previously Director of Development and Innovation of the “*Red Andaluza de Diseño y Traslación de Terapias Avanzadas*” (RADyTA), an organisation of the Andalusian Regional Government, and he brings broad experience in the private sector at the level of biotechnological companies and consultancy.

In 2021, the CNIO filed as many as 12 priority patent applications, 3 requests of divisional patents, and 2 PCT applications for international extension, protecting our intellectual property assets. Also, our efforts in promoting collaborations with industry resulted in about €3M secured through research agreements (an amount 20% higher than in 2020). As much as 65% of CNIO agreements with the private sector were established with international entities. This is a clear reflection of the leadership and influence of the CNIO and our researchers worldwide.

Furthermore, we continue supporting and promoting the participation of CNIO researchers in national and international calls from public agencies and private foundations that fund projects with a strong innovation component. Thus, in 2021 there has been a very active participation in the new National *AEI* Innovation calls, cofunded by the EU Reconstruction Funds “NextGenerationEU”. Two “Proof of Concept” projects have been awarded: a project lead by Héctor Peinado to develop THX-B as a novel anti-metastatic agent, and another project lead by Maria S. Soengas to study the reactivation of the immune system in cancer via MIDKINE. Furthermore, two “Strategic Lines” projects have been awarded involving Marcos Malumbres: a collaboration with Pharmamar to generate a micrometastases-on-chip platform, and a partnership with *CSIC, Hospital Universitario 12 de Octubre* and *MECWINS SA* to give rise to an optoplasmonic immunoassay platform for early detection of breast cancer. Besides that, 4 CNIO *CaixaImpulse* projects are ongoing.

Our drug discovery programme (Experimental Therapeutics Programme) continues working on the co-development of drug candidates from novel targets validated by CNIO investigators, contributing to the generation of new therapeutic agents to fight cancer and ageing-related diseases, which also represent assets for the CNIO. By the end of 2021 the CNIO signed an agreement with the US-based company TOTUS Medicines, by which we licensed them a family of patented PI3K inhibitors developed by the Programme, which has represented a significant upfront payment, plus potential additional income for milestones and royalties.

Our training programmes are one of the key features of the Centre, as an essential part of our mission. To provide training to the new generation of highly skilled researchers is a priority for the CNIO, and we warmly thank our sponsors as they contribute to supporting all our training initiatives.

During 2021, Raúl Rabadán, from Columbia University in New York (USA), was beneficiary of the *Jesús Serra* Foundation’s Visiting Researchers Programme. In addition, Ashwag Mukhtar, from Alneelain University, Sudan, was awarded a grant from the “Science by Women” programme of the *Mujeres por Africa* Foundation, as Visiting Scientist, to

join the Genetic and Molecular Epidemiology Group at the CNIO for a 6-month stay.

In a year marked by COVID-19 in the media, CNIO news continued attracting the interest of the media, keeping the good pace of previous years and marking over 3,033 appearances in press (printed and online) and over 200 audio-visual hits. Not only did our cancer research news attract the attention of journalists, but initiatives such as the #CNIOStopCancer campaign by CNIO Friends, or the 4<sup>th</sup> edition of CNIO Arte (see below), were also covered by general interest media, which science does not usually reach.

On the occasion of World Cancer Research Day on September 24, we organised the 5<sup>th</sup> edition of the event focused on giving visibility to our research activities. After the 2020 edition, which was held online due to the pandemic crisis, in 2021 the event was held in a hybrid format, online and presential at *CaixaForum* Madrid, under the title “Vaccines against COVID-19 and cancer control”. Mariano Esteban, Director of the Poxvirus and Vaccines Group of the National Centre of Biotechnology (CNB-CSIC), was the keynote speaker. His keynote address was followed by a round table focusing on the issue of how cancer research will benefit from what we have learnt during the last two years of the COVID-19 pandemic. Initiatives like this help us to fulfill our goal of bringing science closer to society.

The Institutional Image and Outreach Office is leading several projects that aim to open up new avenues to gain society’s trust and attention, as well as to emphasise the value of science. Thus, in 2021, the 4<sup>th</sup> edition of our CNIO Arte project co-funded by the *Banco Santander* Foundation, which explores the common territories between scientific research and artistic creation, brought together the computational biologist, leader of the Human Cell Atlas, Sarah Teichmann and the visual artist Daniel Canogar. The work “*Fulguraciones*” was exhibited at the CNIO from June 14 to September 11. The funds raised from this initiative totalled €100,000, which contributed directly to our ‘CNIO Friends’ philanthropic initiative. Also, for the first time in Spain, a scientific research institution has been given its own space at the contemporary art fair ARCO (July 7-11). In our stand we exhibited all the works of the different artists who participated in the four editions of CNIO Arte to date, i.e., Eva Lootz, Chema Madoz, Carmen Calvo and Daniel Canogar. The initiative was extremely successful and generated a large number of visits and interactions with citizens, companies, foundations and institutions, which favour the promotion of our Centre and open new venues for potential donations and collaborations. The work “*Fulguraciones*” is being exhibited at the Centre for Art and Media (ZKM) in Karlsruhe (Germany), as part of the exhibition *Biomedica. The Age of Media with Life-like Behaviour*, which will be open from December 18, 2021, to August 28, 2022.



CNIO Arte 2021. “*Fulguraciones*” by visual artist Daniel Canogar.

Also, thanks to the media impact achieved with the CNIO Arte project over the last four years, the work that Eva Lootz designed for the first edition of this initiative, which was based on the figure of Margarita Salas, was selected to participate, together with other Spanish artists, in the exhibition “Synapsis Art and Science in Spain from Cajal to S. XXI” at the Nobel Museum in Stockholm, Sweden (November 24-December 5, 2021).

To increase the impact of this initiative, in 2021 we organised the second edition of a new series of “Art and Science Symposia”, which aims to bring those two areas closer by inviting renowned professionals from both fields to facilitate in an open and enriching discussion on a selected topic. The symposium was held jointly with the presentation of the 4<sup>th</sup> edition of the CNIO Arte project, under the title “*Cartography in the Digital Age*”, chaired by Prof. Carlos Jiménez (Emeritus Professor of Aesthetics, historian and art critic).

Also in 2021, the third event in the series “CNIO Workshop on Philosophy, Science and Medicine: The use of animals in science, ethical and epistemic problems and alternatives” was held at CNIO, with the support of the *Banco Sabadell* Foundation. Discussion topics reviewed the convenience of science continuing to use animals for its tests and clinical trials, both from the point of view of ethical and epistemic values. In addition, the panel of experts discussed possible alternatives to animal experimentation that current science is opening up, and their advantages or disadvantages.

The CNIO Philanthropy and Development Office has been implementing a new fundraising strategy for the CNIO, to build upon the existing and very successful ‘CNIO Friends’ crowdfunding programme. In addition to donations from the public, the team has been working on identifying and providing new philanthropic funding sources, in particular from the

foundation and corporate sectors that will contribute to hiring new research talent for the CNIO. Every donation to the CNIO goes to the ‘CNIO Friends’ initiative, which covers the salaries of new post-doctoral research fellows. Our philanthropic programme actively seeks to build collaborative partnerships with corporate partners, individuals and philanthropic foundations. In 2021, CNIO Friends raised €669,000 in philanthropic donations and received €80,000 from legacies and bequests. We were delighted to welcome 6 new post-doctoral researchers to the CNIO this year, thanks to the funding from our generous donors. To date, philanthropic donations to the CNIO have made possible the incorporation of 26 new researchers since 2016 (24 postdocs and 2 PhD students). We would like to thank all of our donors and CNIO Friends for their continued support of our research programme. Philanthropy enables everyone to contribute to our cancer research, providing support that will have a positive impact on society for generations to come.

Our commitment to gender equality was consolidated in 2021 through the activities spearheaded by our CNIO Women and Science Office (WISE). This is an effort from CNIO volunteers that has contributed to impactful changes that are facilitating both cultural changes and institutional improvements. During this year and thanks to the Zoom platform, our WISE office was able to keep bringing outstanding female speakers, who inspire and encourage us to explore new perspectives and visions on the role of women in society <https://www.cnio.es/en/women-in-science/activities-events/>. In our efforts to educate the future generations without gender bias, and for the occasion of International Day of Women and Girls in Science (February 11<sup>th</sup>), CNIO released a video featuring 6 of its scientists who list the reasons why women should become scientists and invite audiences to join the campaign in social media using the hashtag #HazteCientifica.

With great pleasure and pride, we provide our society once again with a story of our achievements in 2021 and convey our commitment to continue making our best efforts to fulfil our mission of conducting research of excellence in oncology, translating scientific knowledge into clinical practice, and transferring the technology developed at the CNIO to the productive sector for the years to come. ■