



REPORT 2021

**INSTITUTO
DE INVESTIGAÇÃO
E INOVAÇÃO
EM SAÚDE
UNIVERSIDADE
DO PORTO**

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Foreword



This was a particularly exciting but also challenging year for i3S on many fronts and I continue to be highly motivated and impressed by the capacity of all our staff to overcome difficulties and reach important goals for the institute. In terms of research there were many outstanding achievements not only shown by the publications but also the capacity of our researchers to compete at the highest national and international level for funding. Importantly, we have managed to increase substantially the number of applications to projects funded by the EU and our level of success is increasing steadily, including as coordinators.

With regards to the scientific platforms, we had a fantastic year with the award of funding for three national infrastructures; the Porto Comprehensive Cancer Centre, the PT-Openscreen and Cryo-EM. The new equipment will certainly put us in the forefront of national and international technical capabilities.

But we have also move closer to practical applications, including direct benefits for patients, with several licensing agreements, contracts with industry and submission of patents. Of particular note are the innovations awards that represent significant funding for applied research and the new start-ups that were created.

Our commitment to provide clinical services has also undergone a steady raise through the three clinical services: Ipatimup Diagnostics, Center for Predictive and Preventive Genetics and i3S Diagnostics for Sars-CoV-2. Overall, we have provided genetic diagnostics, SARS-CoV-2 tests and other clinical consultations to more that 110,000 patients, a truly remarkable achievement.

Our involvement in training the next generation of scientists continue to be a major force of our institution and during last year we managed to have two rounds of i3S PhD grants and received a large number of new PhD students integrated in the various programs of which i3S participate. I particularly note that the number of foreign students is raising steadily and I encourage you all to help in their integration so that all of our students can benefit from a highly motivating environment.

In spite of the pandemic and all the restrictions that were imposed, communicating our work to society at large continues to be a pillar of our activities. Due to their continued effort, we have managed to reach over 1300 school students and participate in exciting national and international projects guided by the STEAM concept.

This was also a year to prepare for the next steps in the consolidation of i3S. IBMC, INEB and Ipatimup have worked hard to move the integration of their activities into i3S and we have managed to implement a whole range of transversal services that now serve all the i3S community. There is still a lot to do but I am sure that with the dedication and motivation of all, we will steadily move towards a truly integrated institution.

Finally, I would like to express my gratitude to all our staff that through the transversal services allows the institute to exist. Without their dedication, their outstanding work and their collaborative spirit none of this would be possible.

We have challenging time ahead but I am sure i3S will always succeed.



Claudio Sunkel

President of the Board

Executive Summary

The **overall objective of i3S** is to promote high level international research, promote the translation and valorisation of the research output into society, train the new generation of postgraduate students and young researchers, contribute to the promotion and understanding of science by society and support the development of public policies in our areas of expertise. i3S has **74 research** groups organized into three programs: Cancer, Neurobiology and Neurological Disorders and Host Interaction and Response.

The **Cancer Program** aims to unravel fundamental genetic, molecular, and cellular mechanisms relevant to cancer biology, and to translate this knowledge into practical benefit for patients. In 2021, researchers in this program made significant advances in the area of gastric cancer and its relation to bacterial infection. There we also important results regarding ErbB2-positive unresectable gastric cancer and on the role of extracellular vesicles from stem cells to coordinate intratumor communication in pancreatic cancer progression.

The **Host Interaction and Response program** aims to conduct research to comprehend and tackle infections, autoimmune and degenerative disorders, and tissue injuries. Researchers unravelled further aspects of the role of IL-10 during myelopoiesis, opening new perspectives for immunotherapies. We showed how graphene films irradiated with safe low-power NIR-emitting diodes can kill multidrug resistant bacteria and developed potent trivalent inhibitors of thrombin as new anti-coagulation strategies.

The **Program in Neurobiology and Neurological** aims to carry out research to understand the complexity of the nervous system in health and disease. Researchers showed that rewired glycosylation activity promotes scarless regeneration and functional recovery in spiny mice opening new therapeutic avenues for spinal cord regeneration. The effects of addictive drugs microglia activation and how plasmalogens regulate signalling pathways to control the position of the axon.

i3S researchers published a **large number of original articles** in international peer reviewed journals and our cumulative citation has reached more than 37,000. During this year we continue to expand our technological infrastructure through reinforcement of the scientific platforms and our participation in national and international networks.

i3S is engaged with the training and development of the next generation of scientist offering a multidisciplinary environment by active participation in **6 different PhD programs** at UPorto ranging from fundamental Biology to Applied Clinical Research.

This year we continue to host a large number of PhD and Master students. Our **Career Development** Unit organized and delivered information sessions, courses, and workshops related to career and professional development, and the Advanced Training Unit organizes continuous, **professional and post-graduate training**.

We are committed to **promote the valorisation of research results and the transfer of knowledge to society**. We supported the submission of a large number of project proposals to national or international entities raising significant funding. We filed new patents, signed licencing and established new contracts with industry.

i3S has also a strong policy that aims to **promote outreach** and encourages its researchers to participate actions and events aimed at generating a better public understanding of science. Due to the pandemic this was a very demanding year with few visits to i3S. However, the ambassador program was re-started with visits to schools reaching 1292 students and **Education Program** was launched with 13 sessions for over 300 students. We continue to participate in the STEAM ERASMUS+ project in the context of a HYBRID LAB NETWORK.

Another success continues to be the activities of the **three clinical initiatives**. Through Ipatimup-diagnostics, the Centre for Predictive and Preventive Genetics and i3S Diagnostics we serve last year over 100,000 patients.

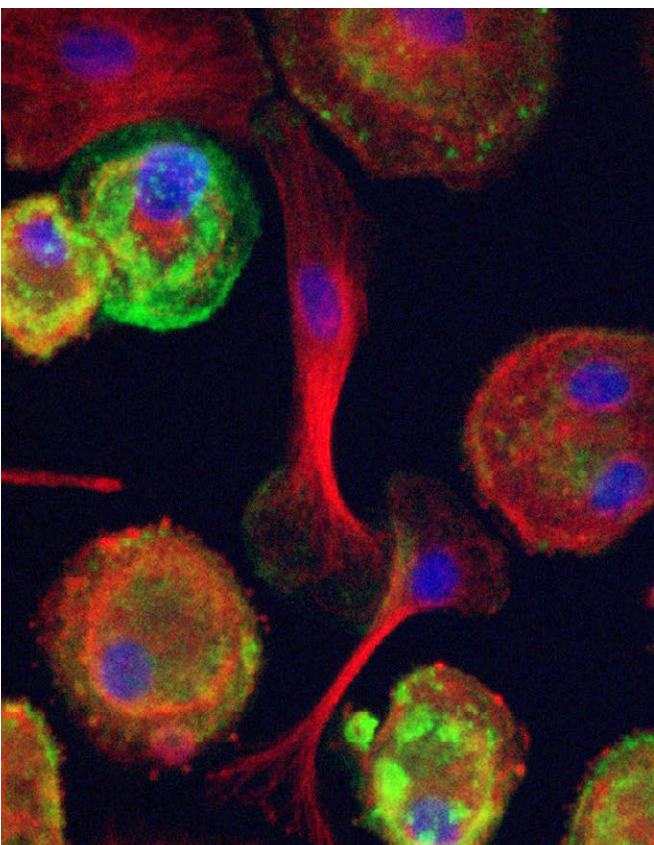
Thus, i3S continues to advance steadily in its mission to carry out outstanding research, train young scientists, promote valorisation of research results and real value for patients and promote a scientific culture throughout society.

Highlights of Scientific Programs

Our research is organized into three programs addressing current, pressing societal and health challenges: cancer, infectious diseases, neurologic disorders, and regenerative medicine. Our approach spans fundamental questions regarding living systems, mechanisms underlying disease, and the development of novel diagnostic and therapeutic strategies. i3S is a very dynamic research hub, with **74 research groups, ca. 435 researchers with PhD and ca. 330 PhD students**. We publish **616 papers in 2021**, many in top international journals following the principles of Open Science, listed at the end of this document.

Cancer

The **Cancer Program** aims to unravel fundamental genetic, molecular, and cellular mechanisms relevant to cancer biology, and to translate this knowledge into practical and tangible benefit for cancer patients. In 2021, we showed that: *Helicobacter pylori* PqqE is a new virulence factor that disrupts gastric epithelial integrity, breaking new ground in the understanding of the pathogenesis of this highly prevalent and clinically relevant infection (*Gut Microbes*); the ST6Gal1 sialyltransferase targets the ectodomain of ErbB2 and regulates sensitivity to trastuzumab, a major problem in the treatment of ErbB2-positive unresectable gastric cancer (*Oncogene*); extracellular vesicles from stem cells coordinate an intratumor communication network that fuels pancreatic cancer progression (*Gut*); plastin and spectrin cooperate to stabilize the actomyosin cortex during cytokinesis, providing the first

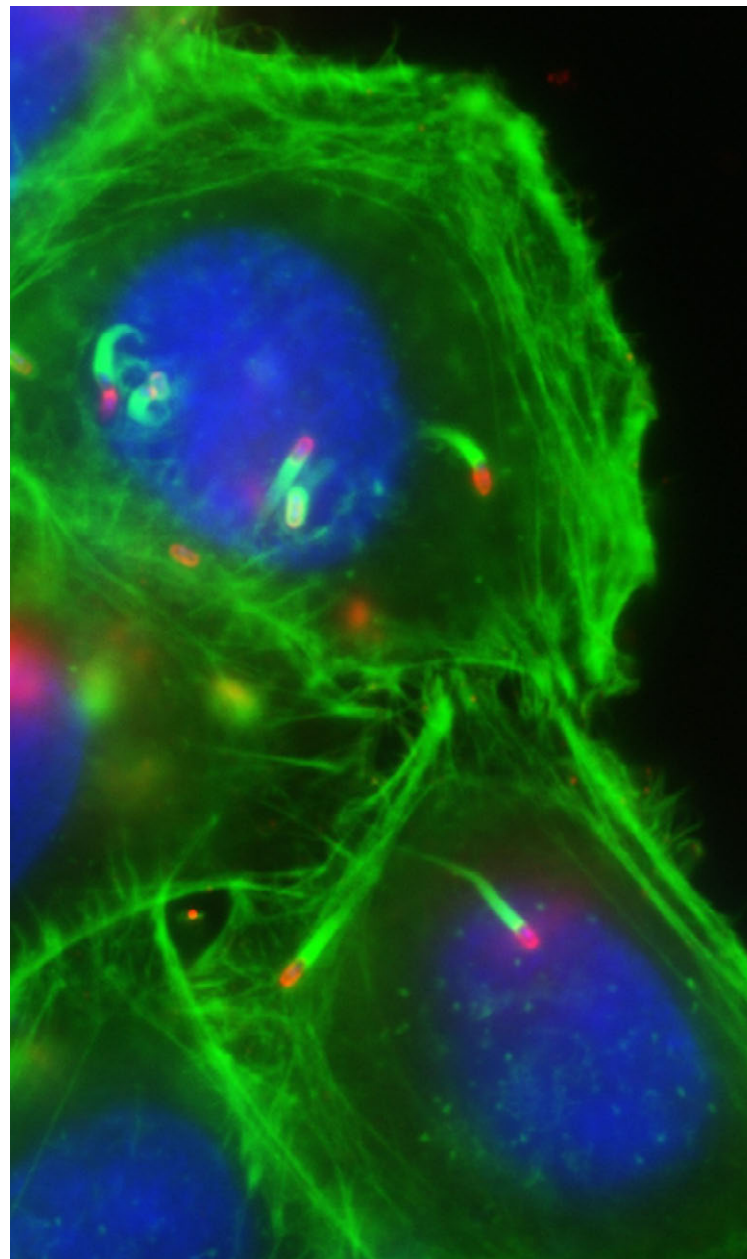


evidence that spectrin contributes to cytokinesis (*Current Biology*), an anaphase surveillance mechanism, defined by a midzone-based Aurora B phosphorylation gradient, prevents micronuclei formation resulting from frequent chromosome segregation errors (*Cell Reports*); FOXM1 repression increases mitotic death upon antimitotic chemotherapy through BMF upregulation, providing a stratification biomarker for antimitotic chemotherapy response (*Cell Death & Disease*).

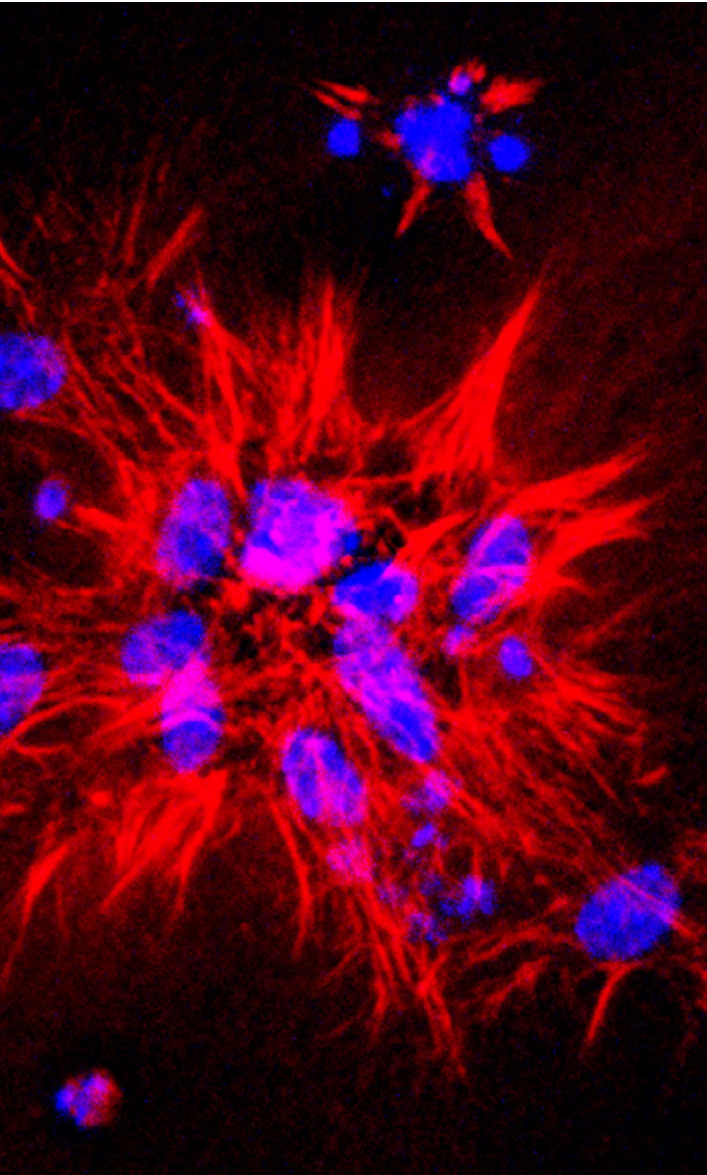
Host Interaction and Response

The **Host Interaction and Response program** aims to conduct ground-breaking research to comprehend and tackle infections, autoimmune and degenerative disorders, and tissue injuries. During 2021, we demonstrated that, in addition to its established anti-inflammatory properties, IL-10 can stimulate the production of pro-inflammatory IFN- γ and induce emergency myelopoiesis, opening new perspectives for IL-10-based immunotherapies (*Cell Reports*).

We showed how graphene films irradiated with safe low-power NIR-emitting diodes can kill multidrug resistant bacteria (*Carbon*). We developed potent trivalent inhibitors of thrombin as new anti-coagulation strategies through the hybridization of salivary sulfopeptides from hematophagous arthropods (*Angew Chem Int Ed Engl*). We also developed a streamlined approach for the fabrication of organ-on-a-chip devices with incorporated microactuators, generating multilayered, membrane-integrated biochips in a matter of hours, using low-cost benchtop equipment (*Adv Sci 2021*). Regarding COVID-19 research, we revealed serum iron as the simplest laboratory test to be implemented as a predictor of COVID-19 severity and progression (*Viruses*).



Neurobiology and Neurologic disorders



In 2021 members of the **Program in Neurobiology and Neurological** disease showed that rewired glycosylation activity promotes scarless regeneration and functional recovery in spiny mice after complete spinal cord transection, an observation that opens new therapeutic avenues for spinal cord regeneration; that astrocyte-derived TNF and glutamate critically modulate microglia activation by methamphetamine, emphasizing a key role in the cross talk between astrocytes and microglia in addiction-related disorders; that plasmalogens regulate the AKT-ULK1 signaling pathway to control the position of the axon initial segment; that c-di-AMP, a likely master regulator of bacterial K^+ homeostasis machinery, activates a K^+ exporter, and that a conformation-sensitive antibody reveals an altered cytosolic PAS/CNBh assembly during hERG channel gating, providing further insight into the working mechanisms of these 2 channels; and that in neural stem cells Brn2 and Ascl1 promote a hierarchical reactivation of transcription during mitosis-to-G1 transition, showing an important role for differential binding of transcription factors to mitotic chromosomes regulated by their electrostatic properties, in defining the temporal order of transcriptional reactivation during mitosis-to-G1 transition.

The landscape beyond research

Awards

The past year was one of transition: while still riding the seemingly insurmountable wave of the pandemic, there was a sort of stable uncertainty, which allowed i3S to pursue its goals and attain them beyond expectation. As a result, the institute produced a number of outputs deserving highlight. To kick off the year, the status of Associate Laboratory was granted to i3S, thus securing 3,9M€/year in funding. Another institutional success was the expansion of i3S to 74 research groups, among which the ones coordinated by the three new ERA Chairs holders.

Fundação “la Caixa” apoia luta do i3S contra o cancro, tuberculose e diabetes

23.07.21 Por Tiago Reis / REIT

Projetos de investigação em Saúde estão entre os 30 selecionados no âmbito do Concurso CaixaResearch de Investigação em Saúde 2021.



Investigadora do i3S recebe bolsa da Pfizer para estudar “doença dos pezinhos”

27.07.21 Por Luísa Melo / i3S

Financiamento de 127 mil euros será aplicado no estudo dos mecanismos que causam morte neuronal nos doentes com Polineuropatia Amiloidótica Familiar (PAF).



As far as scientific achievement goes, the following are particularly noteworthy:

- Projects PT-OPENSREEN and CANCER THERAPY, and consortium Porto.CCC (namely through the project TeamUp4Cancer) draw record funding in the framework of NORTE2020;

- It was a rewarding year in what CaixaResearch applications were concerned: the Health Research program selected three i3S projects in the fields of Oncology (Hélder Maiato), Infectious Diseases (Margarida Saraiva) and Cardiovascular and Metabolic Diseases (José Bessa); and the CaixaResearch Validate program selected two more i3S projects (coordinated by Inês Gonçalves and Ricardo Monteiro);
- Team led by Salomé Pinho unveils the discovery of a unique molecular signature in lupus patients that could potentially be used as a new biomarker. Later this same year, the researcher received one of the three Pfizer Awards handed out;
- Márcia Liz was granted funding of over 125 thousand euros by Pfizer to study the mechanisms that occur prior to neuronal death in patients suffering from familial amyloid polyneuropathy;
- No Stomach for Cancer awards 165 thousand euros in funding for team led by Raquel Seruca to improve the early prognosis of gastric cancer;
- Once again, the Gilead Génese program acknowledges i3S projects, this time around iCoV2PLUS (Alexandra Moreira) and Duo-DIU (José das Neves), awarded 68 thousand euros in funding;
- The Business Ignition Program awards two teams from i3S – NanoPyl and Biomaterials for oral/maxillofacial reconstruction. NanoPyl earned the top spot;
- Two i3S researchers get recognition among peers: Ana Paula Pêgo becomes an ambassador for the journal *Science*, and Nuno Alves joins the European Journal of Immunology's Editorial Board;



- The American Society of Hematology and the Pablove Foundation award a global amount of over 170 thousand euros to Delfim Duarte on account of his work on acute myeloid leukemia;
- i3S startup Fetalix wins the Amyris Innovation BIG Impact Award 2021;

- A team coordinated by Elsa Logarinho funded with 80 thousand euros by the Jérôme Lejeune Foundation to pursue the study of the cellular mechanisms leading to early aging in people with Down Syndrome;
- The first edition of the Maria de Sousa Award distinguishes three young i3S researchers: Andreia Pereira, Daniela Freitas and Mariana Osswald.

Such prolific results yielded in unfavourable conditions as we experienced last year can only bode for even more outstanding results in 2022.

Drivers of Innovation

In 2021, i3S supported the submission of 362 proposals. About 36% were submitted to international funding agencies, whereas 19% relate to H2020/HORIZON calls. Regarding the application for national funds, 78% were submitted to FCT calls; 1 SAICT and 6 PPR applications were also submitted. To date, a total of 95 applications from 2021 were funded, **securing more than 10.6 M€ of competitive funding**.

In terms of IP, we filed 10 new patents and 3 previous applications were granted. We achieved 3 new **licencing agreements and 66k€ in royalties** from previous contracts. We were awarded **9 acceleration/innovation awards that represented 1,044M€ in funding**, coming mainly from the Wellcome Trust Innovator Award, Caixa Impulse and EIT Jumpstarters. The **Co-promotion call form P2020 raised overall 2,615M€**, of which 553k€ directly for i3S. Three new start-ups were incorporated in 2021.

Concerning projects in partnership with healthcare companies (contracted research), beyond the management of ongoing projects started in 2020, i3S started 4 new projects with Pfizer (1), Merck (1) and Gilead (2) in an overall funded budget of 963k€. i3S also signed an important collaboration protocol with Pfizer.

Training and career support

i3S is engaged with the training and development of the next generation of scientist offering a multidisciplinary environment by active participation in 6 different PhD programs at UPorto ranging from fundamental Biology to Applied Clinical Research (i.e. MCbiology, BiotechHealth; PRODEB; PGBioMed, NeuroSciences and GABBA). During 2021 i3S had nearly 300 PhD students and received around 170 MSc students.



i3S has a Career Development Unit (CDU) that has organized and delivered information sessions, courses, and workshops related to career and professional development, namely: “Building and leading research teams” for more experienced researchers, “Project management for all level researchers”, and “Career planning” for PhD students. In addition, CDU has offered one-to-one counselling sessions on professional development to all level i3S researchers and welcome sessions for newcomers together with the Unit of Responsible Conduct in Research.

Communication and outreach

Following a particularly challenging year, during which the Communication Unit's team was able to match various and numerous demands, 2021 was equally - if not more - onerous. We kept pushing for brand recognition and acknowledgment of i3S in schools, within the academia, and within the society at large, and we were largely successful despite the non-existent in-person activity in the first half of the year and only intermittent in the latter semester.

During the first semester of the year, no public activities - visits to i3S among them - were scheduled or carried out, in line with the national contingency plan. The Unit used this downtime of sorts to revamp the Educational Program (EP), whose new version was launched in late August, complete with a new website, and quickly overflowed with bookings and information requests.



Between September and December 2021, the EP organized 26 sessions with Science Ambassadors, reaching an audience of 1292 students. The visits to i3S program resumed more timidly, but by December we had already hosted 7 visits for a total of 160 students. This was also an opportunity to launch a new EP program: workshops. Centered on the topics of genetics, molecular biology.

Reproduction, science values, and neurobiology, these new initiatives got fully booked almost as soon as they opened. Overall, we organized 13 sessions for just shy of 300 students, and provided material and protocols for schools to conduct their own workshops.



The EP also carried through two of the four scheduled activities in the framework of Porto de Crianças, a curricular enrichment program promoted by the Porto Municipality, through which we reached 50 elementary school pupils.

As for international and/or higher education visits, we were able to book three in late 2021, but only one came to fruition (DIS Institute - Denmark), totaling 18 students, although the pace is expected to pick up in the second trimester of 2022.

This was also the year during which the partnership with the Animal Facility cemented in an effort to improve visibility of our good practices regarding animal welfare and experimentation. This partnership spawned a successful social media feature on animal experimentation transparency coined “Transparency Thursday”, which inspired EARA Europe to launch their own initiative in 2020. We also teamed up with the i3S Green Lab Initiative to spread their actions to a wider audience.



The STEAM education ERASMUS+ project (HYBRID LAB NETWORK) was strongly affected by the pandemic situation, but conducting a few workshops in a hybrid format was already feasible last year. This project was the seed for us to start a partnership with ICBAS and FMUP to implement the Biolaboratory - Multidisciplinary Experimentation Project (ongoing training), whose members ran a stand during the European Researchers' Night at i3S.

Indicators:**Activities for high school students**

- Visits to i3S: 7 visits | 160 students
- Science Ambassadors Program: 26 sessions | 1292 students
- Workshops: 13 sessions | 299 students

Training for adults, under- and postgraduate students

- 2nd EMERGENCE Hackathon, reaching around 25 participants
- Two transdisciplinary training activities in the scope of the HYBRID project, which totaled 60 participants

Institutional support and projects

- Improved and streamlined approach to the institutional website, namely regarding the intranet, allowing a more automatic insert of contents in English and Portuguese. In fact, the website is now available in Portuguese, all news and events available in both languages, though the translation process is still ongoing.
- Direct support/enrolment in several EU and FCT projects (MIRACLE, RESTORE, FIBRALUNG, PhasaGE, INTEGRITY) and management of communication work packages in the scope of the EU-funded ERA Chairs.

Activities and channels for the general public

- Media mentions: 1296 (TV - 73)
- Social media (followers):
 - Facebook: 16328 (11,2% GR*)
 - Twitter: 3107 (22,7% GR*)
 - Instagram: 2861 (19,6% GR*)
 - LinkedIn: 23120 (32,9% GR*)**GR: growth rate*

- First European Researchers' Night hosted by i3S, involving several partner institutions of the Asprela campus, and offering both in-person and hybrid activities

Display of exhibit "Patchwork", open to the public and featuring a few guided visits with guest architects

Media and press office activities

In 2021 there were almost 1300 media mentions on account of i3S achievements, an increase even relative to already media-heavy 2020 (1041), which could be largely due to a few i3S researchers who became regular faces in the news whenever answering pandemic-related pressing issues was necessary. Unlike the previous year, research developed in i3S throughout 2021 drifted from the ongoing pandemic. A few highlights:

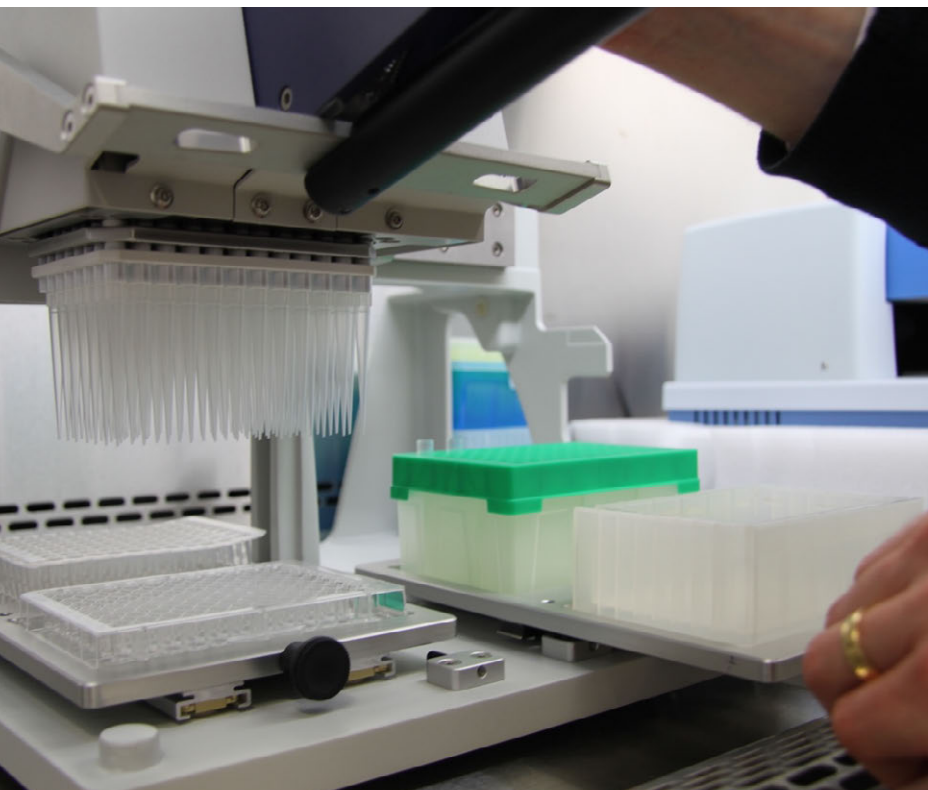
- CaixaResearch programs select five projects coordinated by i3S researchers
- Major awards attributed to i3S researchers throughout the year: Pfizer Award, Amyris Innovations BIG Impact Award, Maria de Sousa Awards, among many other distinctions and grants
- Initiatives targeting the public at large resumed, the European Researchers' Night being the main feature
- Ample participations of i3S experts commenting on COVID-19 developments and helping to clarify misconceptions and seemingly controversial decisions



Much like in previous years, our researchers were featured in many science dissemination programs, namely '90 Segundos de Ciência' and Porto Canal's 'Mentes que Brilham', totaling 73 TV appearances

Platforms boosting research

Research at i3S is heavily supported by our 13 scientific platforms. With cutting-edge equipment and highly qualified professionals, the i3S Scientific Platforms are at the forefront of technology to promote and sustain the highest standards of scientific research and development.



Experienced and accomplished specialists coordinate and manage these infrastructures, who are available to provide personalized guidance and support in the processes of experimental design and implementation, as well as provide advanced scientific services.

All our scientific platforms are run on an open access policy and we regularly host both national and international researchers. During this year i3S have continued to expand their technological infrastructure.

We participate in 8 infrastructures of national road map and coordinate 2 of these. Further, we fully integrate 11 international infrastructures networks, to highlight the national delegates at the *Euro-Bioimaging* and *EU-OPENSCREEN* ESFRI projects are from i3S scientific platforms. Of utmost importance, this year i3S has been supported by 2 projects, the Porto Comprehensive Cancer Centre (15 M€), and PT-OPENSCREEN national infrastructures (2,2 M€), allowing to further equip and hire human resources to our scientific platforms.

Clinical initiatives

Ipatimup Diagnostics

In 2021, IPATIMUP Diagnostics maintained the high-quality standards successfully achieved in the previous years through CAP accreditation being its recognition reinforced by the IPAC accreditation renewal in two different standards (ISO 15189 and ISO/IEC 17025).

Other goals for 2021, such as maintaining the unit as a professional training center, maintaining the number of tests from the previous year, achieving better client satisfaction with our services and participating in research projects with health institutions and pharmaceutical companies, and inclusion in international networks, were totally accomplished.

Highlights include:

- CAP and IPAC accreditation (ISO 15189 and ISO/IEC 17025).
- Participation in the international networks EUROFORGEN.
- Overall client satisfaction was maintained relatively to the previous year.
- IPATIMUP has maintained its position as a professional training center through its nomination by the Portuguese Physician's Association (Ordem dos Médicos) as a reference center in molecular pathology of the Anatomical Pathology internship.
- Participation in research projects with health institutions and pharmaceutical companies, as well as the establishment of specific national and international service contracts with hospitals and other health institutions, increased and diversified in 2015.
- Reference center in Portugal for predictive biomarker testing in several cancer types.
- Organization of the "17th European Congress on Digital Pathology".

Statistics:

- Total of exams: 46335 - increased 14,8% (32631 pathologic anatomy, 6193 genetic diagnosis, 4895 molecular pathology).
- Prescribing institutions: 708 (376 health centers, 158 private clinics, 72 public hospitals, 43 private hospitals, 24 laboratories, 18 international institutions, 5 public institutes, 2 colleges, 1 city council).

Center for Predictive and Preventive Genetics

CGPP/IBMC, is a clinical initiative of i3S, in the area of Medical Genetics, offering services to the community in the health sector: molecular genetic testing (one of the main providers to the NHS); medical consultations of various specialties; and genetic (clinical and laboratory) training for residents and interns of various specialties and other health professionals.

Its services are highly differentiated in the diagnosis, follow-up and genetic counselling of patients and families. CGPP provided clinical extension services in two NHS hospitals (CHUSJ and HSEIT), and has protocols with multiple patient associations.

As a result of the combination of its scientific, clinical and technical skills, its main objectives are:

- Carrying out clinical molecular genetic tests;
- Applying a multidisciplinary pre-symptomatic genetic testing protocol for healthy family members at risk for late onset hereditary diseases (includes Genetic Counseling, Clinical Psychology and Psychosocial assessment, as well as genetic testing);
- Provision of differentiated consultation services for the diagnosis of hereditary diseases, in the areas of Medical Genetics, Neurology, Neuropediatrics, Psychiatry, Pediatrics and Hematology;
- Undergraduate and postgraduate education (in collaboration with UP and other universities) and continuous training for Family Medicine doctors and other health professionals;
- Maintenance of a Biobank (DNA, cell lines and other biological products);
- Support for basic and clinical research on genetic diseases at the IBMC, as well as other institutions that request it.

Its clinical staff is composed of Medical Geneticists, Neurologists, Psychiatrists, Clinical Psychologists, Genetic Counsellors, Nurses and Social Service professionals. Its technical staff is composed by health technicians specialized in Molecular Genetics and Bioinformatics.

CGPP is fully licensed by ERS. CGPP has a quality management system and carries out annual external evaluation of quality (EQAs) for a wide range of tests, through the EMQN. It is accredited by IPAC (through NP EN ISO 15189) to perform blood sampling and molecular genetic testing, since 2014.

Its laboratory has been supplementing a growing need for genetic tests, namely using next-generation sequencing (NGS, especially based on Illumina technology), with sequencing of the whole-exome as having as the reference (over 8,000 full exomes so far). CGPP developed and validated dedicated bioinformatics pipelines, following international guidelines and best practices.

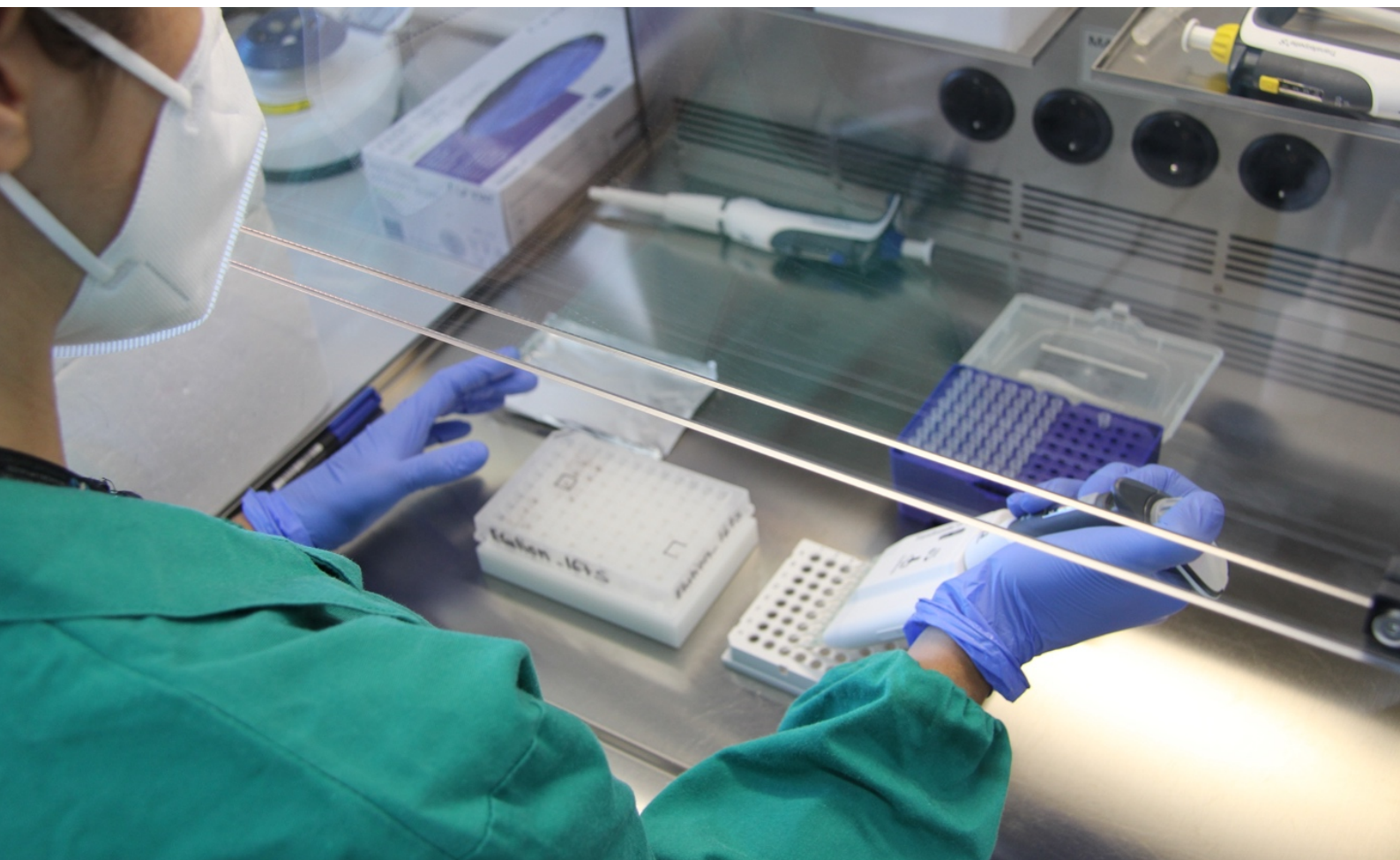
Despite all difficulties, 2021 was another year of large growth in its 3 main areas of action, as evidenced by the volume of work produced:

- 6,822 genetic tests requests (2,893 for NGS studies), including 5,411 new biological samples; and 5,176 reports issued;
- 20 clinical sessions to discuss clinical cases and laboratory methodologies, in 9 hospital services;
- 843 consultations carried out: 237 at the CGPP and 606 at various hospitals;
- 6 curricular internships for medical residents of Neurology (4), Psychiatry (1) and Paediatrics (1);
- 2 scientific meetings organized, including the 9th Meeting on Neurogenetics, at the HDE; and the 6th Course of Genetics for Primary Health Care physicians;
- once again, participation in the i3S Science Ambassadors' Program;
- as a direct result of provision of services, 21 communications made at medical congresses (3 invited, 5 oral communications and 17 posters); and 18 articles in peer-reviewed scientific journals;
- the oral communication "Incidental carrier detection of 639 variants in patients tested for diagnostic purposes: added value for genetic counselling and a glimpse about recessive diseases in Portugal" (presented by Fátima Lopes), won the Best Clinical Research award at the annual meeting of SPGH.

i3S Diagnostics

i3S Diagnostics is a clinical service currently entirely dedicated to the mitigation of the COVID-19 pandemic through the screening of the SARS-CoV-2 virus. This infrastructure, operating since March 2020, represents one of several i3S contributions to the national effort in the fight against the COVID-19 pandemic. It also demonstrates the i3S capacity to explore the established scientific and technical excellence to respond to public health emergencies.

Part of the i3S Diagnostics missions is the development of new diagnostic methodologies for infectious diseases and the preparedness and response to future infectious disease outbreaks.



i3S Diagnostics routinely offers SARS-CoV-2 RT-qPCR based testing and professional antigen tests for patient care in a competitive time frame, with the capacity to perform 1 000 tests per day. i3S Diagnostics also provides basic molecular tests to i3S research groups. i3S Diagnostics is approved as COVID-19 diagnostic Laboratory by

the National Institute of Health (INSA) and Registered by the Health Regulatory Entity (ERS). i3S signed contracts to perform tests with the ARS-Norte, the Ministry of Labour, Solidarity and Social Security (MTSS) and private companies. The i3S Diagnostics technical staff is composed by highly specialized technicians in Molecular Biology and Bioinformatics. i3S Diagnostics has a quality management system and carries out annual external evaluation of quality (EQAs), through the National Program for External Quality Assessment (PNAEQ) and the WHO Global Round of Laboratory Proficiency Testing.

Work carried out in 2021:

- performed 18 000 SARS-CoV-2 RT-qPCR tests for the ARS Norte.
- performed 42 000 SARS-CoV-2 RT-qPCR tests for private entities.
- reached over 0,9 M€ turnover.
- maintains and develops a biobank of more than 20 000 COVID-19 North Portuguese nasopharyngeal samples that constitutes a unique tool to address time-series questions of importance in public health.
- managed the National strategic stock of 1 million COVID-19 tests to be distributed amongst partners from North Portugal.
- coordinated a research and development project aiming not only at supporting i3S Diagnostics to carry out faster and more reliable diagnostic tests, but also at accelerating the research on SARS-CoV-2 co-infections and infectiveness/aggressiveness of circulating SARS-CoV-2 strains.
- participated in several research projects in collaboration with i3S research groups.
- trained its technicians on new equipments and technics.
- externalized some of its technicians to Basel (Switzerland) in recognition of their expertise in SARS-CoV-2 molecular testing.
- participated to the 1st Porto One Health Day of the Porto University.
- participated to several TV interviews (RTP1, Porto Canal).

In December 2021, i3S Diagnostics set up a collection center for PCR and antigen tests open to all patients with medical prescriptions. i3S Diagnostics is now pursuing the diversification of its activities to ensure its sustainability.

Publications

During 2021 researcher at i3S contributed to 616 publications of which 456 were original articles. There 52 original articles published in journal with IF higher than 9. In 2021, there cumulative number of citations was 37.101 according to Scopus data base.

Original Articles

1. Bilal U., Hessel P., Perez-Ferrer C., et al. **Life expectancy and mortality in 363 cities of Latin America** Nature Medicine 27(3): 463-470, 2021. [IF: 53.4 (*)]
Pubmed: [33495602](#)
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