2020
RESEARCH AND TEACHING REPORT BST

/Salut

Banc de Sang i Teixits

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CRYO-APRON
TEMP SHIELD, INC
Scilabwear

Anna Millán Álvarez
General Director

Presentation by the general director

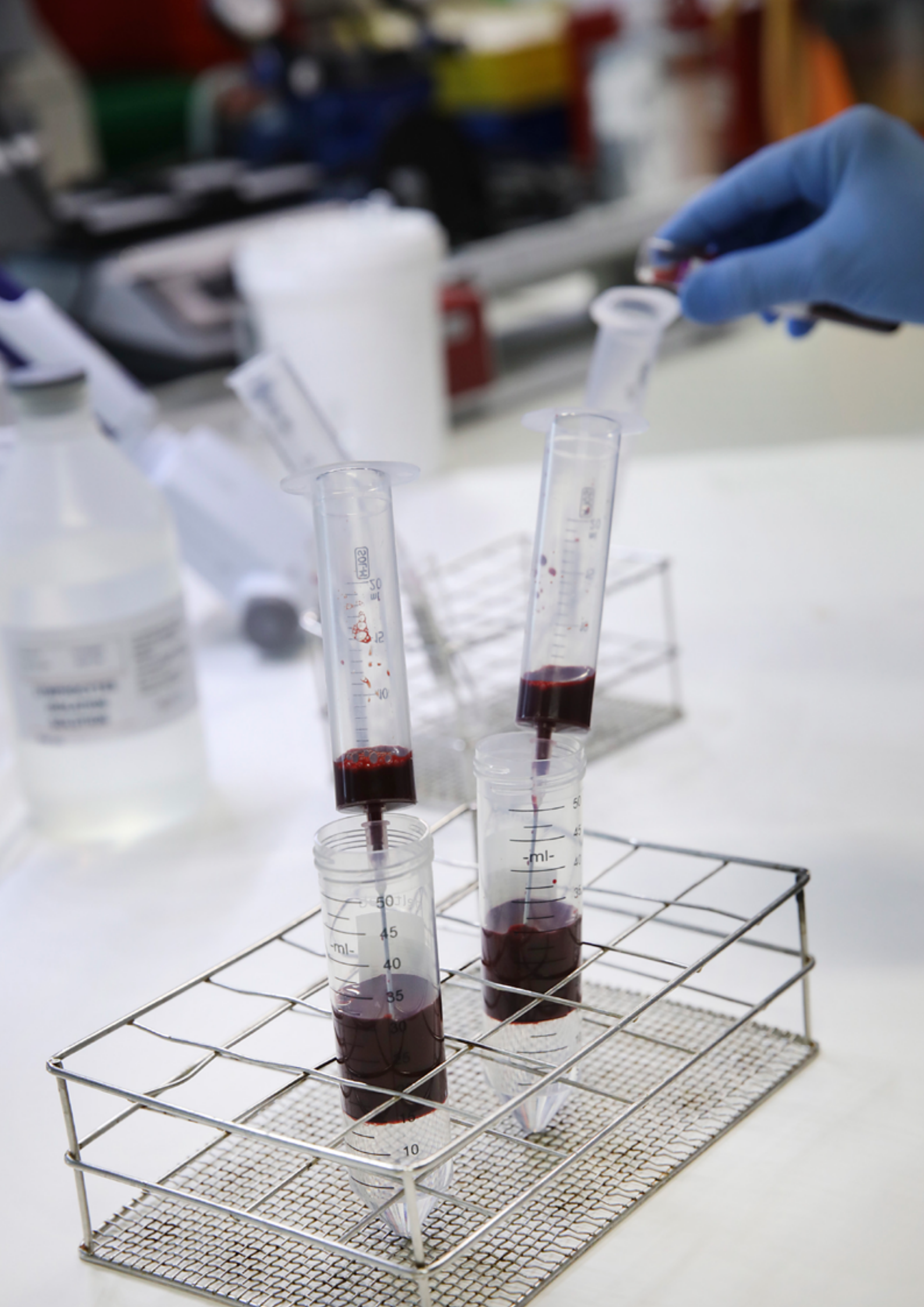
We present the report on the research activity carried out by the professionals of the Banc de Sang i Teixits (Blood and Tissue Bank, BST) in 2020, a year shaken by the serious pandemic we have suffered and which has also marked the way in this area. Despite all the difficulties, we have initiated our own projects and taken part in others in order to be able to address therapeutic solutions for COVID-19, such as clinical trials with convalescent plasma, among others.

During 2020 we increased the number of projects, national and international collaborations, patents and publications, achieving the best figures in recent years. It was a very positive way to conclude the 2017-2020 strategic plan proposed by the previous management. In these four years, we have been able to deploy our capabilities to advance in the lines of work set out in the plan and we have boosted our research and innovation capacity, always with a clear focus on society's needs and healthcare. After these four years, we can say with satisfaction that the BST is now more research-intensive and more innovative.

Now is also the time to embark on a new chapter and draw up a new plan that is optimal for facing new challenges, such as advanced therapies, immunotherapies and the new tissues of the future. A new plan to further enhance the innovation and research capabilities of the Banc de Sang i Teixits and to continue contributing in the best possible way to our society in general, and to patients in particular.

As General Director of the Banc de Sang i Teixits, it is very satisfying to be able to present this report to you, which is also a thank you to a whole team of great professionals who, day by day and in the most adverse circumstances, make us better people. Thank you very much.

Anna Millán Álvarez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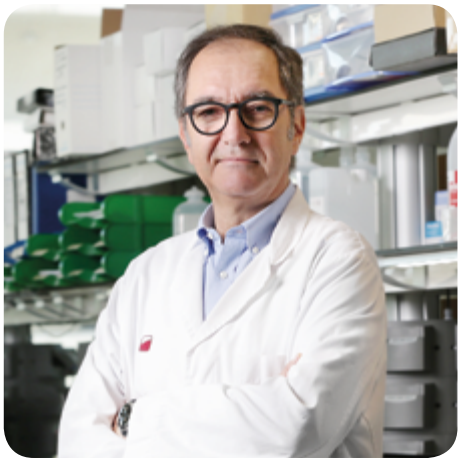


Joan Garcia Lopez
Scientific Director

Presentation by the scientific director

Once again, we present you with a summary of the scientific and educational activities of the BST, in this case for the year 2020.

It has been an exceptional year in which the SARS-CoV-2 pandemic has dominated the headlines and has deeply conditioned the activity of our organisation, not only by putting its resources to the test, but also by showing all the value we can bring to healthcare and to society as a whole.

We can be modestly proud, because our capacity for innovation has made it possible to provide diagnostic and therapeutic solutions to face this new disease, from mass PCR tests, to the development of clinical studies with plasma from convalescent patients and advanced therapy drugs.

The year 2020 marks the end of the cycle of the strategic research plan that we started in 2017. This means that, in a way, the data we have to show are a reflection of this plan's results.

The plan's general objectives were twofold: to improve the transfer of research results to society and to achieve greater scientific impact from our research activity. Although there is room for improvement, I believe that, to a large extent, these objectives have been achieved.

During these 4 years, more than 20 new products or services, fruit of our capacity for innovation, have strengthened our offer. A similar amount is in various stages of development thanks to the 5 internal calls that have funded more than 30 R&D and innovation projects and supplemented competitive external funding.

On a scientific level, we can say that we have practically doubled our productivity and have improved our interaction with clinical research groups and research institutes, progressively centralising the knowledge generated in our field. Precisely, in relation to knowledge and its transfer, for the first time we have made an inventory of all this activity, highlighting all of the BST's teaching potential.

One very important milestone was the creation of a specific career path for research staff, which will surely strengthen our ability to create, attract and retain talent.

It is true that there are challenges that have not been fully met, such as the hoped for improvement in access to competitive funding, but even so, I would like to highlight the undeniable effort made by the BST professionals, without exception.

Finally, a few words of farewell. This will probably be the last report to which I contribute. Therefore, it is from here that I extend my thanks to all the people who have accompanied me on this journey, especially those who have been closest to me.

Joan Garcia Lopez

2020 highlights

It is difficult to talk about 2020 without referring to the SARS-CoV-2 pandemic. Like so many others, the Banc de Sang i Teixits (Blood and Tissue Bank, BST) had to respond to this critical situation by offering the best of itself, in terms of both its assistance and research potential. Some of the most relevant contributions are described below.

- The Transfusion Safety Laboratory (LST) validated the SARS-CoV-2 RNA detection technology using the TMA (transcription-mediated amplification) technique on the Panther platform (Grifols). This validation was carried out in record time in full lockdown and using COVID-19 samples from Vall d'Hebron Hospital. This served to obtain the CE marking of the reagent, which was immediately and routinely implemented at the BST as well as other national and international laboratories.
- This development enabled the creation of the "COVID-19 laboratory", where 295,808 determinations were made in 2020.
- Subsequently, the LST implemented the quantitative RT-PCR technique for SARS-CoV-2 in respiratory samples required by the protocols of the Catalan Public Health Service and to support the BST's COVID-19 laboratory.
- The LST, in collaboration with epidemiologists from the Catalan Ministry of Health and CEEISCAT, have also carried out studies on the seroprevalence of SARS-CoV-2 in blood donors before and after each epidemiological wave, providing valuable information on the epidemiological evolution and diagnostic efficacy at all times.
- The BST has actively participated in the COVID-19 Convalescent Plasma Programme, lending the resources of its different services and laboratories.
- It has also been responsible for the development of the COVIDMES clinical trial involving five hospitals in the Catalan public network, to evaluate the impact of treatment with mesenchymal cells in respiratory distress caused by SARS-CoV-2 infection.

Silvia Sauleda

Gloria Sòria

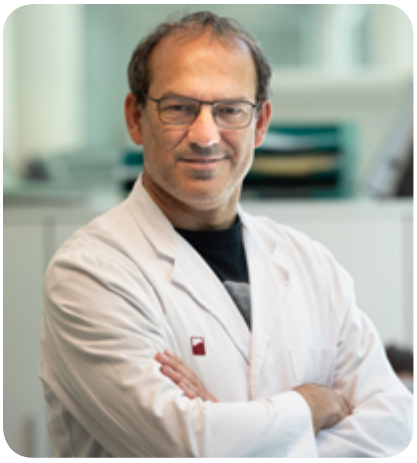
We were able to explain all this in a publication in the journal Blood Transfusion (BLOOD TRANSFUS 2021; DOI 10.2450/2021.0259-20).

Although many of our other activities were overshadowed by the pandemic, they are still worthy of mention:

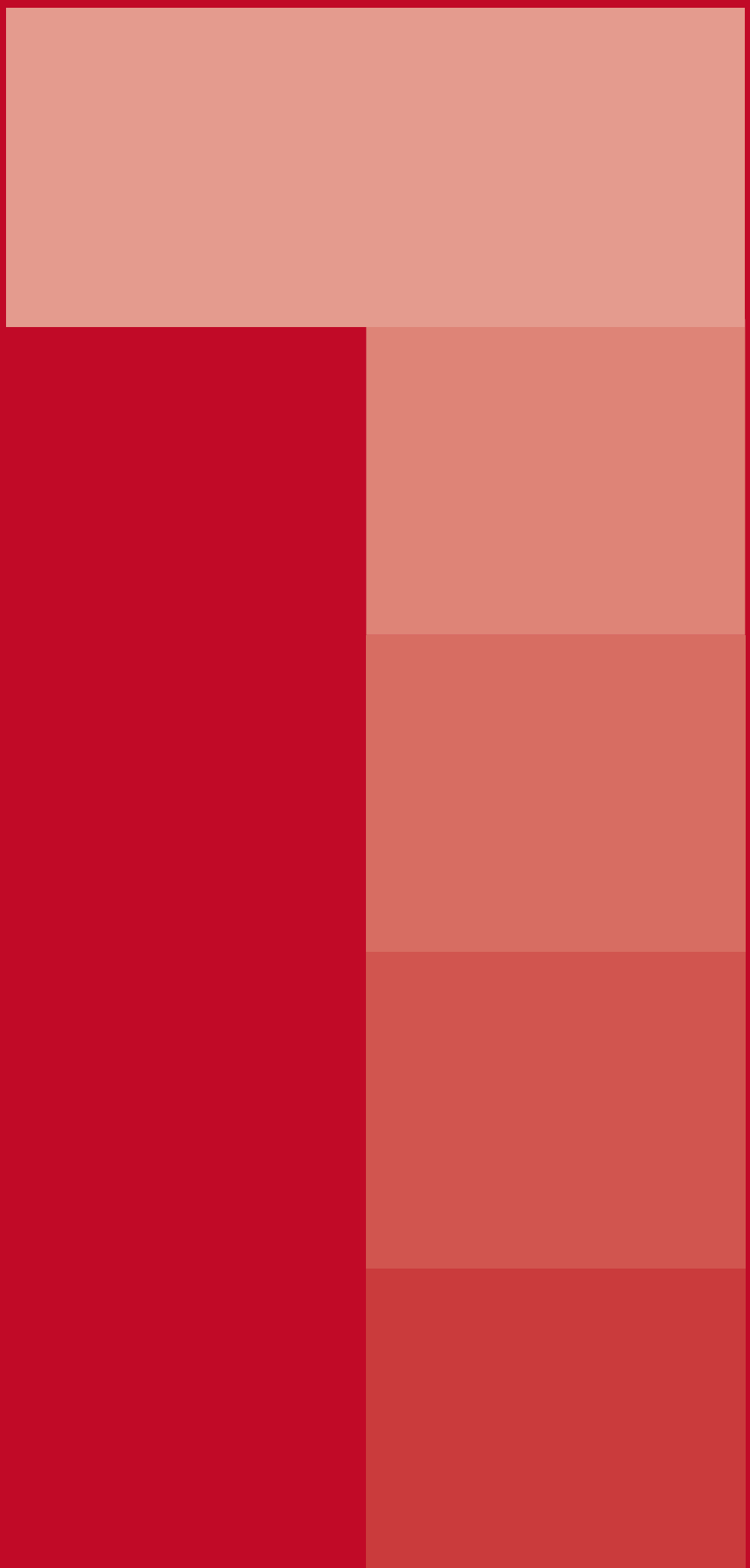
- Our home transfusion programme, carried out in collaboration with home hospitalisation units, set an example for innovation in transfusion practice. The aim of the programme is to avoid moving patients for the sole purpose of performing a transfusion. This improves their quality of life and frees up resources needed to care for other patients.
- We obtained a new European patent for a new tissue engineering product: "Composition for regenerating bony tissue, method for preparation and use thereof"

Joaquim Vives

Sergi Querol



Banc de sang i teixits



Banc de Sang i Teixits

The Banc de Sang i Teixits (Blood and Tissue Bank) is the public company of the Department of Health whose mission it is to guarantee the supply of sufficient quality blood for all citizens of Catalonia. The BST manages and administers the donation, transfusion, and analysis of blood and blood plasma. It also acts as a centre for obtaining and processing tissues and umbilical cords and develops other lines of action as a centre specialising in immunobiology, molecular analysis, cell therapy and regenerative medicine.

- It constitutes the backbone of the haemotherapeutic system in Catalonia.
- The BST's activity extends to all public and private centres in Catalonia and other areas of the State, with a service of proximity to both donors and customers.
- Its intention is to function as a first-class centre for management, innovation and research in haemotherapy and tissues.

The BST participates in its own research projects or works in collaboration with all the centres of the Catalan Health Institute, with many of those of the Hospital Network for Public Use and with Catalan universities, as well as promoting strategic alliances with centres, researchers and with industry.

1.1. Governing Bodies

The governing bodies of the Banc de Sang i Teixits are the Board of Directors and its committees.

1.1.1. Board of Directors

Chairperson
Francesc Gòdia Casablancas

Vice-chairperson:
Xènia Acebes Roldan

Secretary
Cristina Ortiz González

Members
Manel Peiró Posadas
Antoni Castells Garagou
Enric Contreras Barbeta
Joan Xavier Comella Carnicé
Miquel Rutllant Bañeras
Emili Sullà Pascual
Ivan Planas Miret
Roberto Gili Palacios

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1.1.2. Committees of the Board of Directors

Economic and Audit Committee
Ivan Planas Miret
Emili Sullà Pascual

R+D+i Commitee
Francesc Gòdia Casablancas
Roberto Gili Palacios
Miquel Rullant Bañeres
Joan Garcia Lopez

Tissue Strategy Commitee
Antoni Castells Garagou,
Anna Vilarrodona Serrat,
Francesc Gòdia Casablancas.

1.2. Executive and Management Bodies

1.2.1. Executive Committee

General Director
Anna Millán Álvarez

Deputy Director
Isabel López Asión

Director of Communication and Donation
Aurora Masip Treig

Director of Information Technologies
Antoni Masi Roig

Director of Hospital Services
Enric Contreras Barbeta

Director of the Tissue Bank
Anna Vilarrodona Serrat

Director of Operations and Genaral Services
Joan Ovejo Cortés

Director of Strategic Planning and Advanced Therapies
Joaquim Delgadillo Duarte

Director of the International Division
Joan Ramon Grífols Ronda

Research and Education Director
Joan Garcia Lopez

1.3. Advisory Bodies

1.3.1. Internal Scientific Committee

The Internal Scientific Committee is the advisory body in charge of ensuring that all tasks in the organisation bearing on the promotion and development of R+D+i are carried out.

The tasks performed by this committee include:

- Reviewing R+D+i policy and ensuring that it be disseminated and known.
- Coordinating the deployment of the Strategic Research Plan (SRP) and evaluating its degree of success.
- Ensuring that the annual R+D+i objectives are met.
- Overseeing activities associated with the technology observatory (surveillance, foresight, analysis, etc.).
- Periodically reviewing scientific production, economic aspects and research staff.
- As the unit responsible for the programmes, participating in research activities and evaluating the progress of projects (anticipating deviations and problems).
- Reviewing the systematics of the process for continuous improvement.

Composition

Scientific Director
Joan Garcia Lopez

Research Programmes Coordinators
Sílvia Sauleda Oliveras
Aurora Masip Treig
Eduard Muñiz Díaz
Sergi Querol Giner
Ricardo Casaroli Marano

Representative of the territorial centres
Enric Contreras Barbeta

Management representative
Isabel López Asión

Chairperson of the External Scientific Committee
Alejandro Madrigal

Research and Education
Ruth Coll Bonet
Miriam Requena Montero
Elisabet Tahull Navarro

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1.3.2. External Scientific Committee

The new SRP has re-established the External Scientific Committee.
The tasks to be performed by this committee include the following:

- Annually evaluating the R+D+i activity carried out at the BST.
- Giving opinions and making suggestions on the adequacy and follow-up of the SRP.
- Making recommendations on research lines and programmes (promoting, auditing, redirecting ...).
- Giving guidance on how to increase external resources for research and on possible alliances to be established.
- Acting as an external technology observatory.

Composition

Prof. Alejandro Madrigal (president)
Scientific Director of the Anthony Nolan Research Institute, London (UK)

Prof. Catherine Bollard
Director of the Centre for Cancer and Immunology Research at the Children's Research Institute, Washington (USA)

Prof. Antony Atala
Director of the Wake Forest Institute for Regenerative Medicine (USA)

Prof. Masja de Haas
Sanquin Research and Dept of Immunohaematology and Blood Transfusion, LUMC, Leiden (Holland)

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1.4. Location

Pg. del Taulat 106

The corporate headquarters of the Banc de Sang i Teixits is located at the confluence between Passeig del Taulat and Carrer de Lope de Vega, in the 22@ technological district of Barcelona. It is from this headquarters that the various lines of activity and many of the organization's 800 professionals are centralised. The BST also has offices in the main hospitals in Catalonia.

800
professionals

technological district
22@
in the Barcelona

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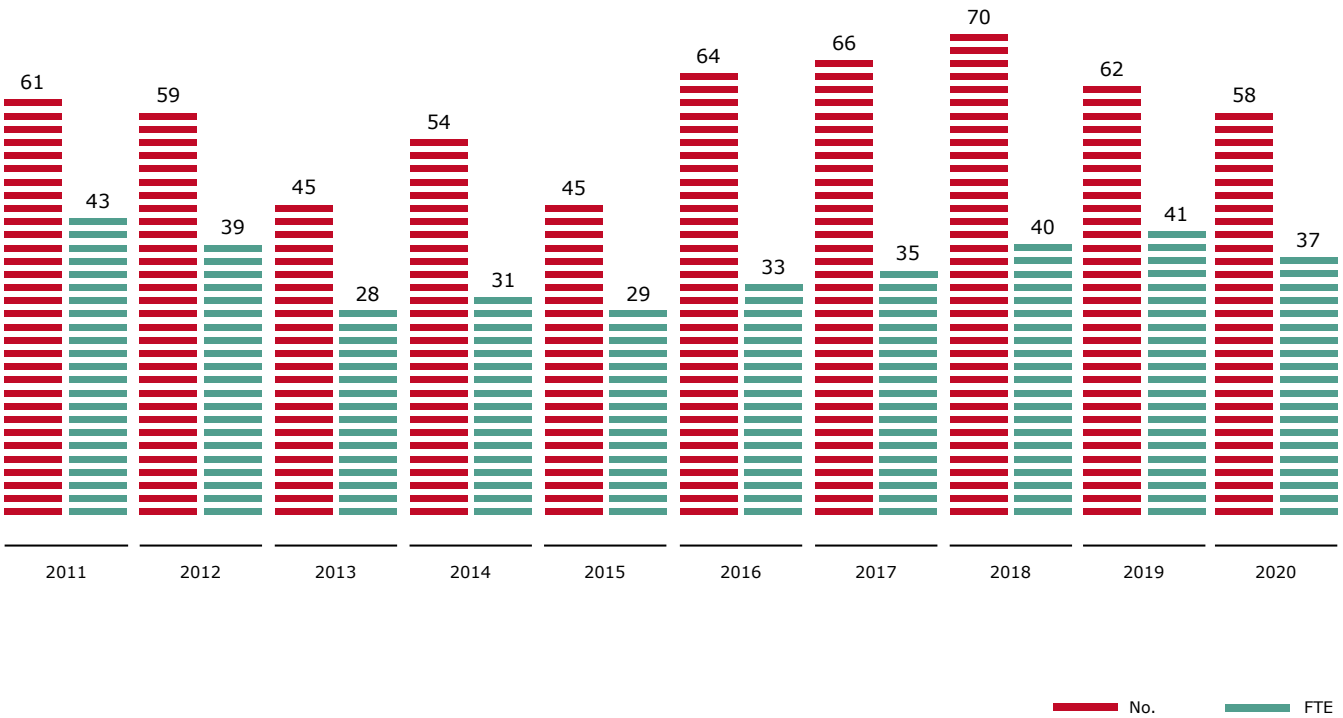
1.5. Summary of research activity

1.5.1. Research and technical staff

Research and technical staff 2020

	No.	FTE	No. of men	FTE of men	No. of women	FTE of women
Principal investigators	6	3.2	5	3.1	1	0.1
Senior researchers	23	14.6	3	0.4	20	14.2
Researchers	23	14.2	6	2.9	17	11.3
Support staff	6	5.0	1	1.0	5	4.0
TOTAL	58	37.0	15	7.4	43	29.6

Evolution of research staff since 2011



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1.5.2.
Economic data

Research funding 2020

435,013€.

Agreements with industry

2,156,866€.

Own funds*

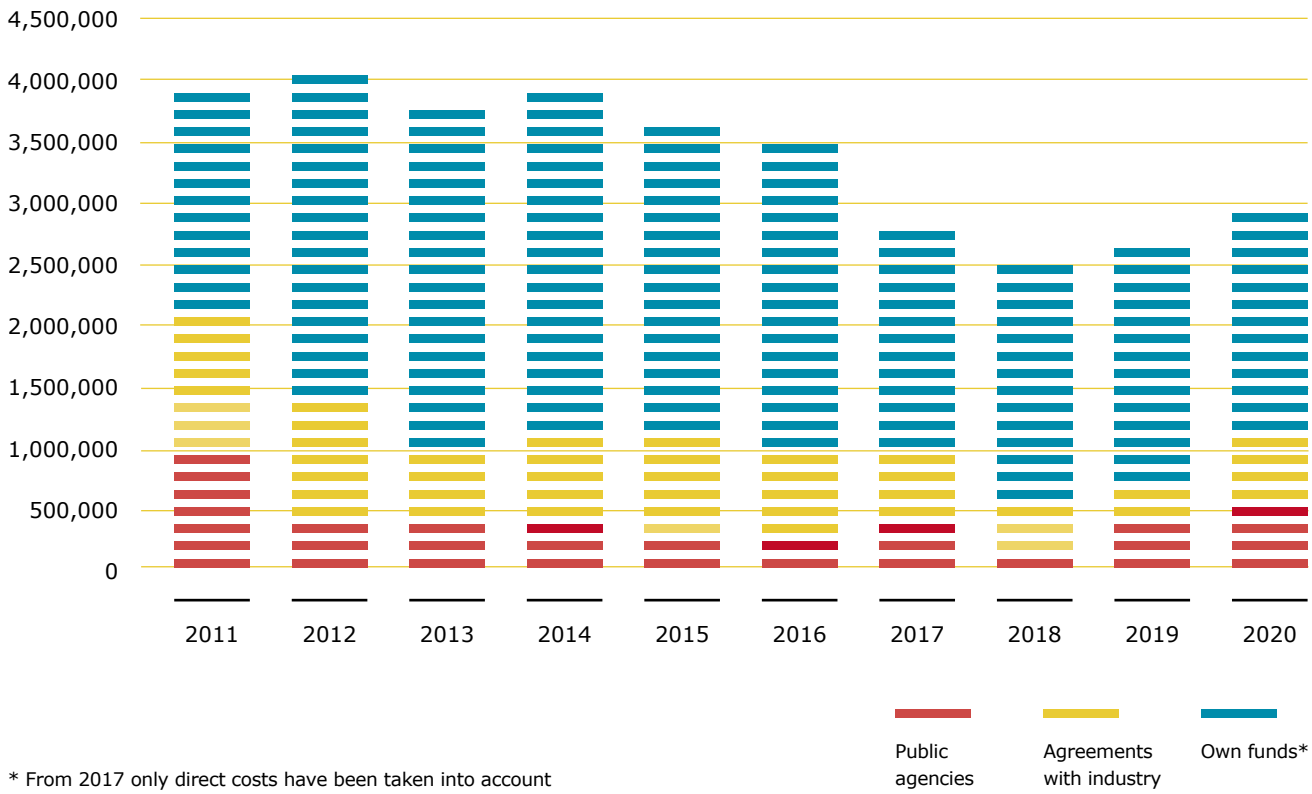
* Includes expenses for full-time or part-time staff and internal research funding

289,769€.

Public agencies

Total 2,881,648€.

Research projects



* From 2017 only direct costs have been taken into account

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1.5.3. Organisation of research at the BST

The Strategic R+D+i Plan 2017-2020 establishes five research programmes

R&D&I 2017-2020

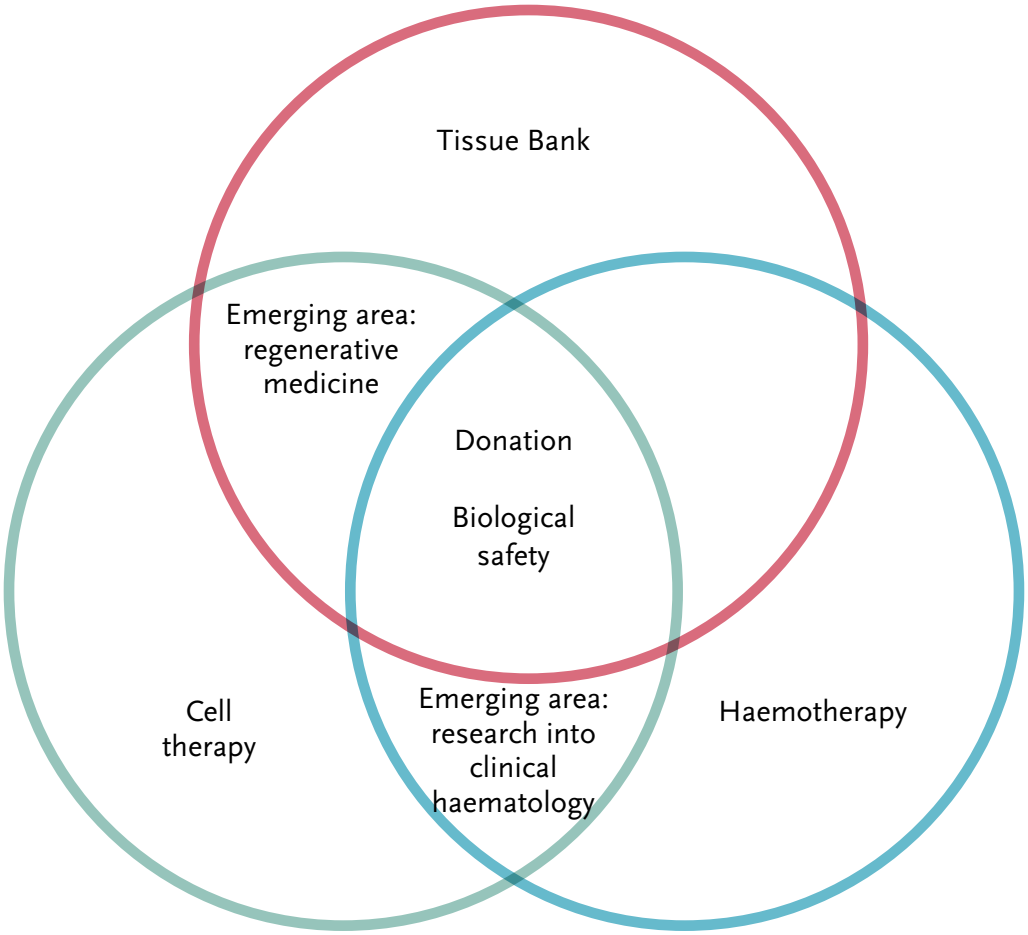
5 Research Programmes

Three core programmes:

- **Haemotherapy:** immunohematology, transfusion, molecular diagnosis, process development (Eduard Muñiz Díaz)
- **Tissue bank:** development of products and processes of the tissue bank, regenerative medicine (Ricardo Casaroli Marano)
- **Cell therapy:** transplant immunobiology/immunotherapy, regenerative medicine (Sergi Querol Giner)

Two transversal programmes:

- **Biological safety:** emerging pathogens, epidemiological studies, harmonisation between products (Sílvia Sauleda Oliveras)
- **Donation of blood, cells and tissues:** study of donation behaviours, donation ethics, donation promotion, protection, well-being and comfort of the donor (Aurora Masip Treig)



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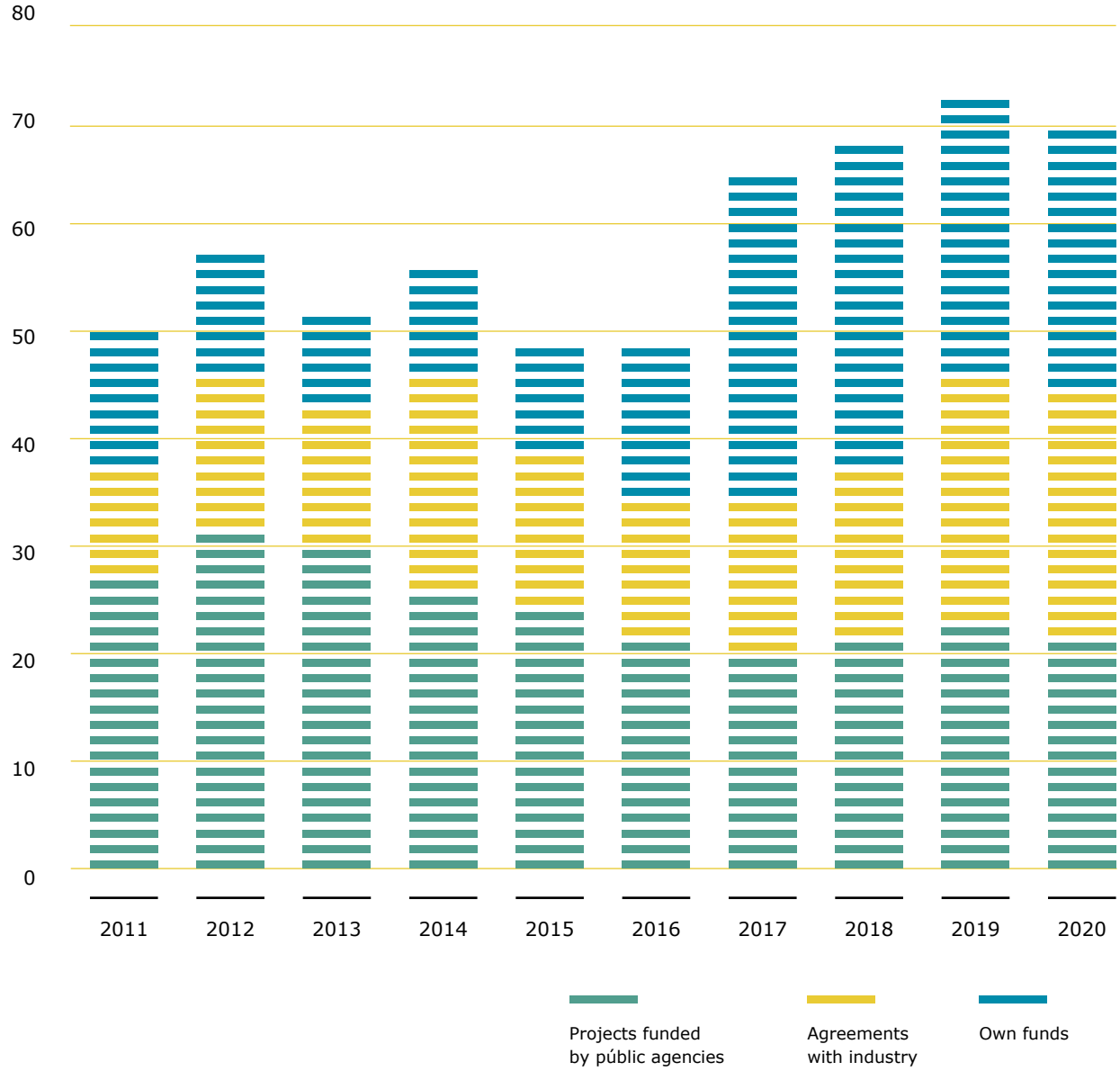
1.5.4. Research projects

Research projects



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Active projects during 2020

	BST PRINCIPAL INVESTIGATOR	COLLABORATION
PUBLIC AGENCIES		
Catalan Association of Hemophilia	1	
BIOCAT		1
European Commission		1
FLSIDA		1
Spanish Multidisciplinary Group in Digestive Cancer		1
TV3 Marathon Foundation		1
Carlos III Institute of Health	4	7
Ministry of Science, Innovation and Universities	4	
AGREEMENTS WITH INDUSTRY		
Achilles Therapeutics Limited		1
Adaptimmune LLC		1
Autolus Limited		1
Bayer	1	
BioNTech SE		1
Boehringer Ingelheim		1
Celgene Corporation		3
Cellnex Telecom, S.A.		1
Gamida Cell Ltd		1
GSK Research & Development Ltd		1
Instituto Grifols, S.A.	1	1
Lion Biotechnologies, Inc.		1
Novartis Pharma AG		5
Institut de Recherches Internationales Servier		1
OWN FUNDS		**26**
TOTAL		**68**

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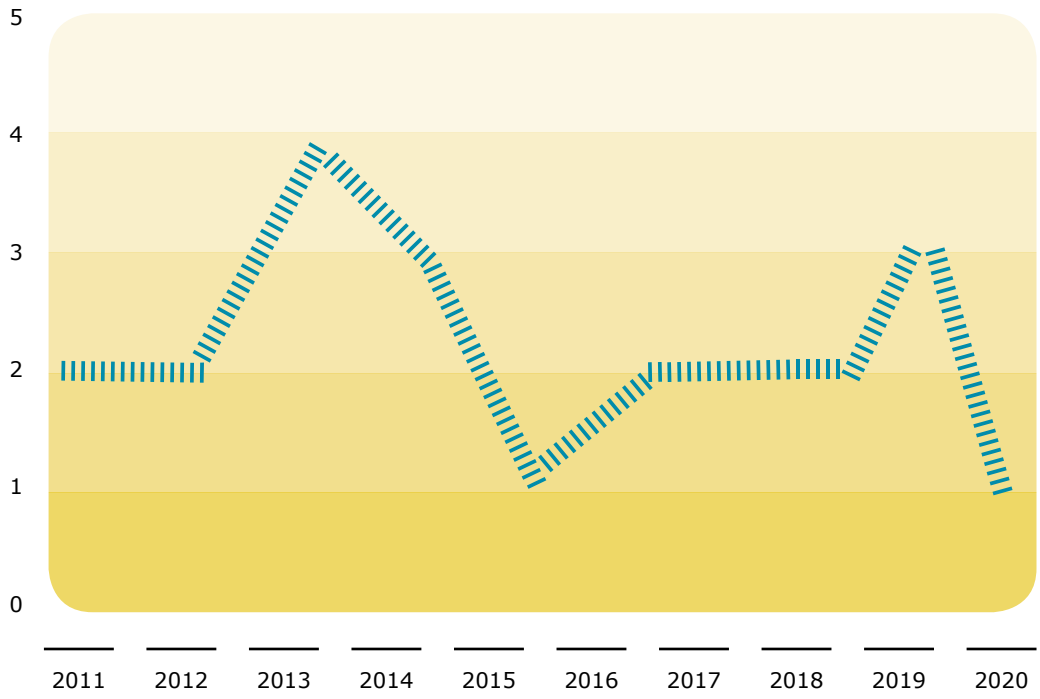
1.5.5. Doctoral theses

These were the theses read by BST investigators.

Theses

PHD STUDENT	THESIS TITLE	DIRECTORS
Dinara Samarkanova	Derivatives of platelet-rich plasma from umbilical cord blood for therapy and development of clinical trials for the treatment of skin and ocular ulcers	Sergi Querol Giner and Ricardo Casaroli Marano

Dinara Samarkanova



Evolution of the doctoral theses defended since 2011

1.5.6. Publications

The number of publications in scientific journals by BST researchers in 2020 was 62, with an impact factor of 243. The average impact factor was 4. 47% of the articles were published in first QUARTILE journals.

The 2019 *Journal Citation Reports* (JCR) were used to calculate the 2020 impact factor. Original articles, reviews, and editorials were included for the calculation.

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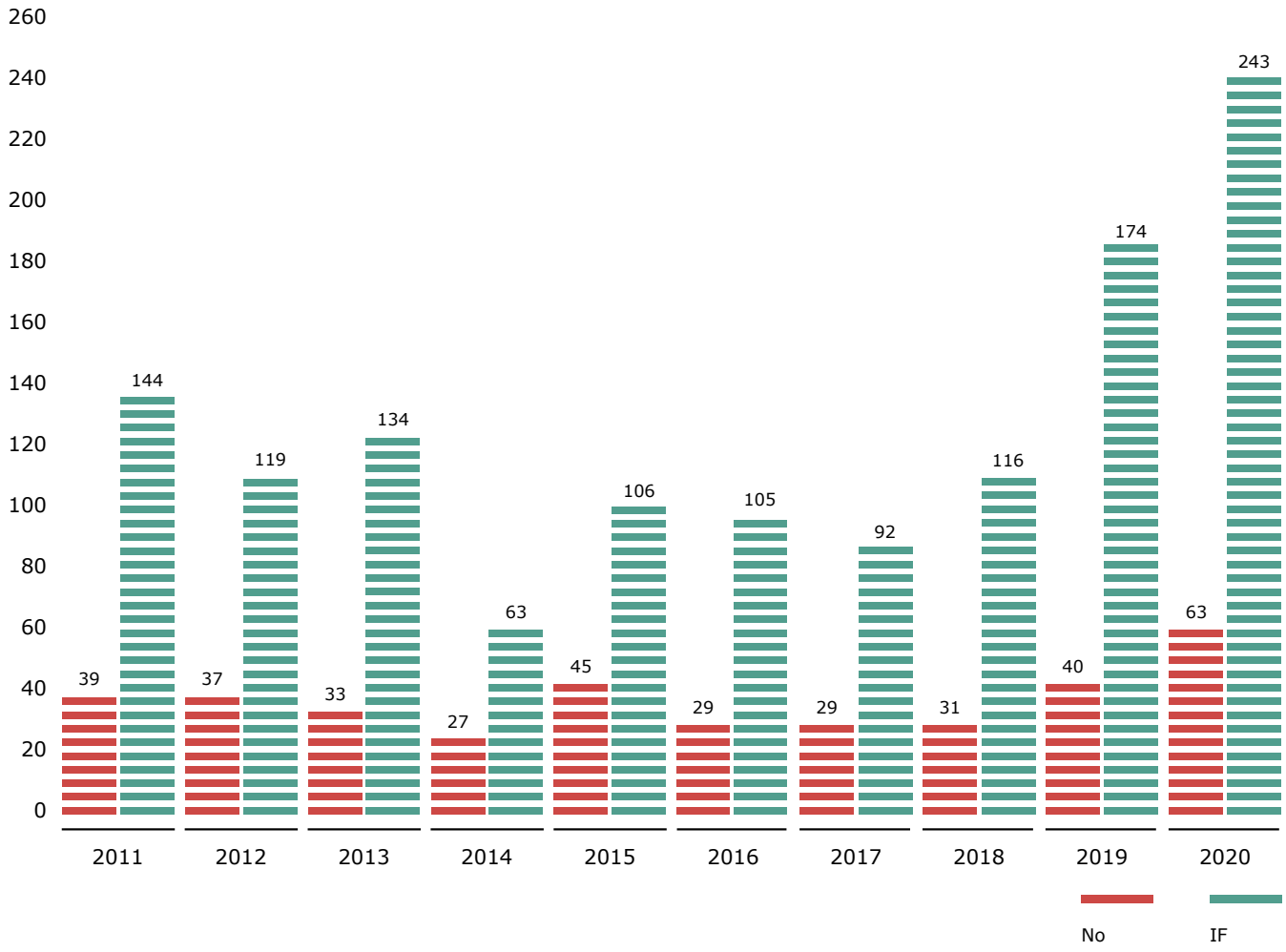
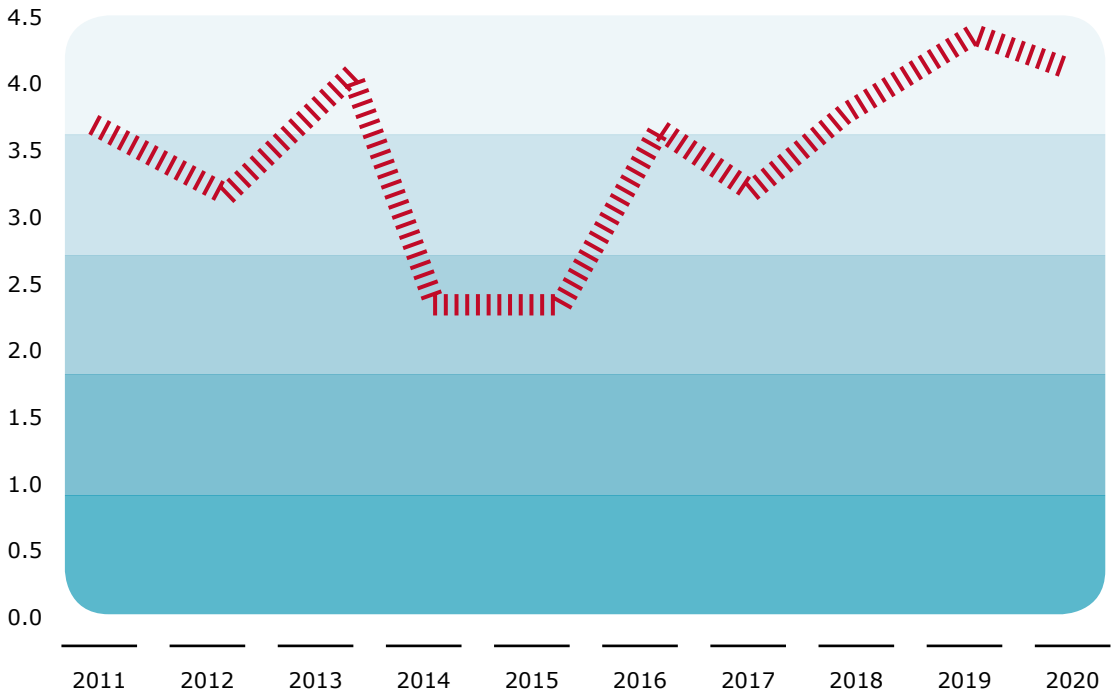
Publicacions and accumulated Impact factor



Medium Impact Factor

Evolution of the BST's scientific production



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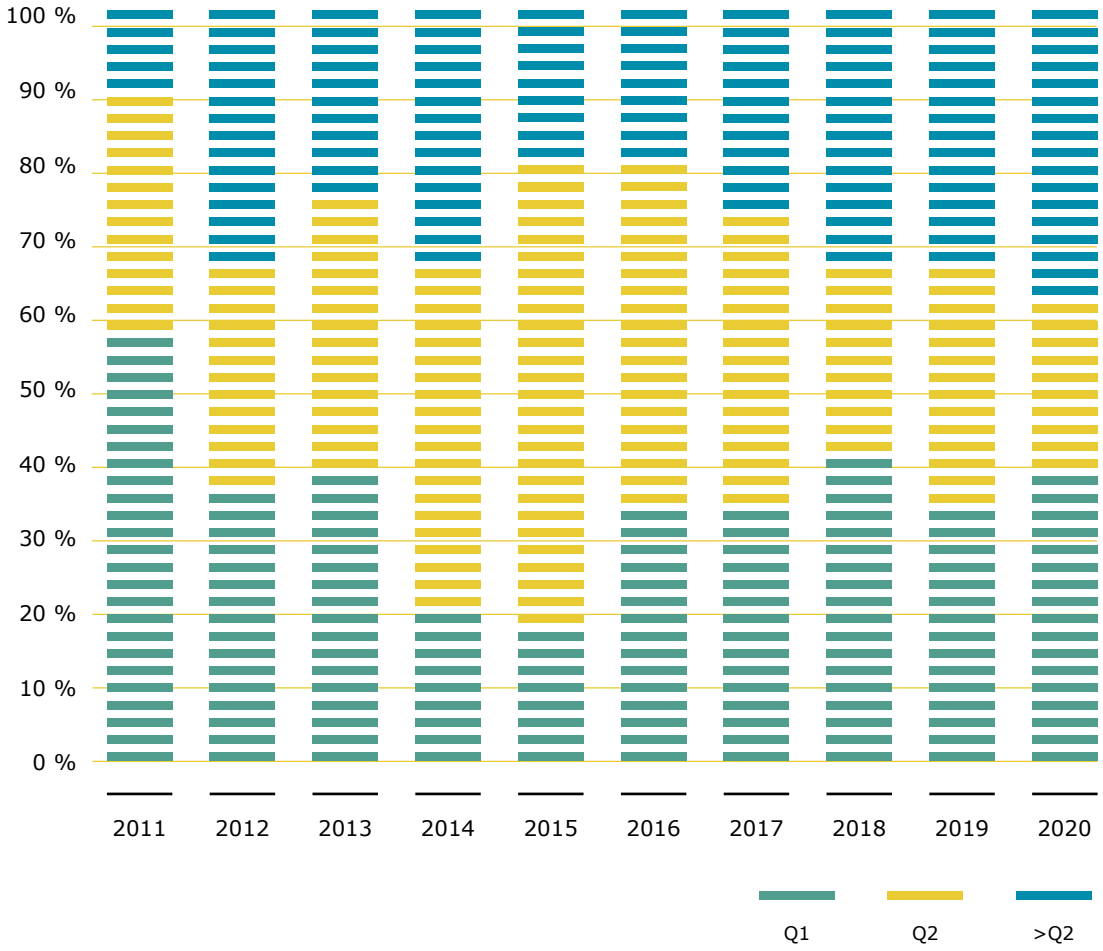
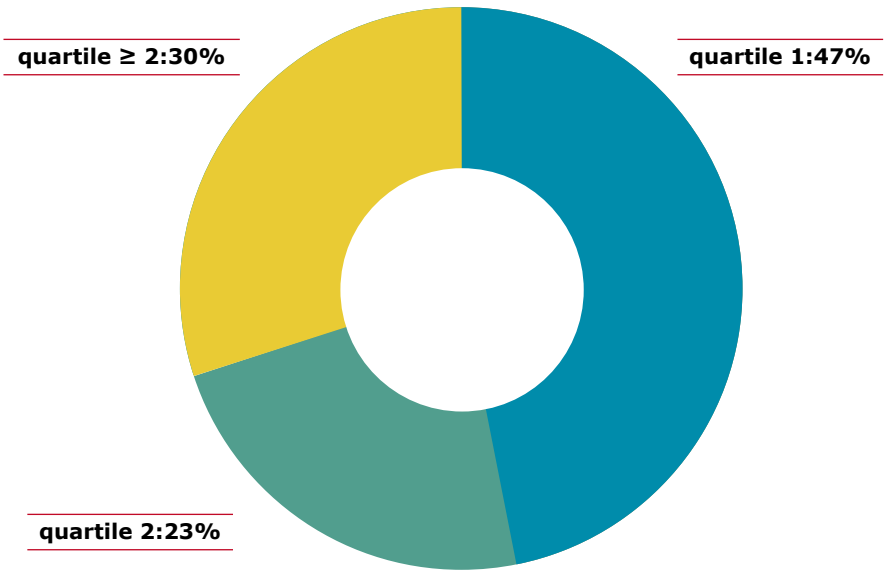
Classification of publications



2020 BST publications by quartiles



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1.5.7. Patents and protection of industrial and intellectual property

The BST has three patents granted in Spain, one granted in the United States, one granted in Mexico, and two granted by the European Patent Office and validated in several European countries.

1.6. Innovation

One of the objectives of this report is to highlight BST professionals' innovative capacity to create new products and services as a result of internal R&D.

In this regard, 2020 saw the incorporation of new products and services.

Here are just a few of them:

The **Cell Therapy Service** has generated a new product from cord blood: endothelial progenitors. Initial studies have been submitted, two new procedures for manipulation of cell therapy starting materials have been validated and entered into the catalogue (CD3 depletion using CliniMACS Plus, CD56 positive selection using CliniMACS Plus), and a bank of mesenchymal cells from ovine umbilical cord Wharton's jelly has been created for pre-clinical studies.

The **Territorial Centres** have created a pilot plan for home transfusion in collaboration with the home hospitalisation units.

The **Transfusion Safety Laboratory** has created a COVID-19 laboratory for the detection of SARS-CoV-2 RNA by TMA (transcription-mediated amplification).

The **Cell Laboratory** has developed new techniques for the quality control of the manufacture of advanced therapies, especially CAR-T cells and mesenchymal cells.

The **Tissue Bank** has developed a thick dermal matrix for the reconstruction of the rotator cuff or abdominal wall. We have also developed hypothermic skin preservation, amniotic membrane extract and frozen/freeze-dried amniotic membrane (for the treatment of ocular pathologies) and tectonic corneas, a new tissue that is already available to the clinic.

In addition, a new parameter, the innovation index, has been definitively incorporated, which relates the annual turnover of new products to overall turnover. **The rate of innovation achieved is 2.3%.**

1.7.

Web

The Banc de Sang i Teixits website

The Banc de Sang i Teixits has two websites: www.bancsang.net and www.donarsang.gencat.cat. Both of them have versions in Catalan, Spanish and English.

The www.bancsang.net page contains information about the entire organization. The contents are structured into the six main theme blocks (corporate information, donors, recipients, professionals, R+D+i, teaching).

It is regularly updated with news and has an application that allows one to manage online orders. It incorporates documentation in PDF format and videos.

The www.donarsang.gencat.cat is aimed at donors and potential blood donors, with the aim of disseminating the donation as an act of altruism, civic commitment and citizen participation.

It provides information on the need to donate blood and its uses. Moreover, it allows one to search by population or postal code for upcoming mobile donation campaigns. It also includes a news section on blood donation.

From the web, you can also book an hour to donate blood or plasma and check how many people have a reservation to donate.

In the private area of this website, donors can modify their contact details, consult their donation history, their blood type and download the result of the blood test.

The bancsang.net/blog blog contains information on the corporate, healthcare and scientific activity of the Banc de Sang i Teixits and is aimed at all citizens. It includes an e-newsletter that anyone who wants to receive content updates by email can subscribe to.

The moltesgracies.net blog contains stories of people who needed blood and tissues for their treatment. It includes a form for any recipient to tell their story. In this way, we want to visualise the importance of donations, putting a face to the people who directly benefit from them.

www.bancsang.net
www.donarsang.gencat.cat
www.bancsang.net
bancsang.net/blog
moltesgracies.net

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FALCON

BST research activity

Research activity of the BST

2.1. Haemotherapy programme

Research in the haemotherapy program aims to foster knowledge about the practice of transfusion medicine and related technologies.

Researchers in this program are currently studying the basic biology and clinical implications of a wide range of problems bearing on transfusions, immune responses to transfused blood, and underlying mechanisms, as well as practices related to the processing, storage and safety of blood.

In another respect, it also includes the research and development of diagnostic and decision-making techniques and processes that make transfusions safer, more effective and more efficient.

This program, in addition to its core, is characterised by the simultaneous involvement of central laboratories and territorial centres.

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Director
Eduard Muñiz Diaz

Support Staff
Natàlia Comes Fernandez
Sergio Huertas Torres
Lorena Ramírez Orihuela

Researchers
Agueda Ancochea Serra
Nina Borràs Agustí
Neus Boto Ruiz
Laia Closa Gil
Irene Corrales Insa
Iris Garcia Martinez
Cecilia Gonzalez Santesteban
María José Herrero Mata
Carlos Hobeich Naya
Laura Martín Fernández
Antoni Masi Roig
Laia Miquel Serra
Núria Nogués Gálvez
Francisco Vidal Pérez

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Projects with PI or CO-PI from the BST

Research projects

Principal investigator: Eduard Muñiz Diaz
A phase I, open-label dose-finding study on CC-90002, a CD47-targeted monoclonal antibody, in subjects with hematologic cancer and advanced solid tumours
Funding organisation: Celgene
File: I.2018.063
Duration: 2019 - 2020

Principal investigator: Núria Nogués Gálvez
ID-VITRORED: Obtaining in vitro red blood cells from IPSCs of donors with erythrocyte phenotypes selected and optimised by genomic editing, as an alternative to current red cell panels
Funding organisation: Ministry of Science, Innovation and Universities
File: RTC-2017-6367-1
Duration: 2018 – 2021

Principal investigator: Francisco Vidal Perez
Addressing inherited haemorrhagic disorders of complex etiology through the application of a common exome sequencing strategy
Funding organisation: Carlos III Institute of Health
File: PI18/01492
Duration: 2019 – 2021

Principal investigator: Àgueda Ancochea Serra
A study on the effects of the transfusion of red blood cell concentrates, tranexamic acid and fibrinogen concentrate for the treatment of haemorrhage secondary to severe trauma during the prehospital care phase
Funding organisation: BST
File: 2018-001867-22
Duration: 2018 – 2021

Principal investigator: Maria José Herrero Mata
HLA and other genes of interest for transplantation typing using nanopore technology: "Third Generation Sequencing"
Funding organisation: BST
File: I.2019.036
Duration: 2020 – 2021

Principal investigator: Antoni Masi Roig
Implementation of massive data analysis and exploitation tools. Application to the predictive study based on retrospective data from BST donation campaigns
Funding organisation: BST
File: I.2019.040
Duration: 2020 – 2021

Principal investigator: Rafael Parra López
Improvement and optimization of health care for congenital coagulopathies: moving towards personalized, comprehensive and coordinated medicine in specialized centers in Catalonia
Funding organisation: Catalan Hemophilia Association
File: I.2020.001
Duration: 2020 - 2021

Principal investigator: Anna Millan Alvarez
Prospective anti-SARS-CoV-2 screening in blood and plasma donors: identification of convalescent plasma for transfusion in COVID-19 patients
Funding organisation: BST
File: I.2020.023
Duration: 2020 - 2021

Principal investigator: Anna Millan Alvarez and Laura Medina Marrero
Observational study on the clinical impact (safety/efficacy) of convalescent plasma transfusion in COVID-19 patients of the Catalan hospital network
Funding organisation: BST
File: I.2020.033
Duration: 2020 - 2021

Principal investigator: Enric Contreras Barbeta
A Multicenter, randomized, open-label, parallel group pilot study to evaluate safety and efficacy of convalescent methylene blue treated plasma from donors recovered from COVID-19 with standard medical treatment versus standard medical treatment alone in subjects with COVID-19 requiring admission to the intensive care unit
Funding organisation: Instituto Grifols, S.A.
File: 2020-001299-14
Duration: 2020 - 2021

Principal investigator: Pável Olivera Sumire
XATOC: Xarelto + Acetylsalicylic Acid: Treatment Patterns and Outcomes Across the Disease Continuum in Patients With Coronary Artery Disease and/or Peripheral Artery Disease
Funding organisation: Bayer
File: NCT04401761
Duration: 2020 - 2021

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Joint projects

Principal investigator: Juan Carlos Souto Andrés (Hospital de Sant Pau), Francisco Vidal Perez (BST)
RETROVE 3. Involvement of platelet adhesion and related phenotypes, and their genetic determinants, in the risk of venous thromboembolic disease
Funding organisation: Carlos III Institute of Health
File: PI18/00434
Duration: 2019 – 2021

Principal investigator: Rafael Duarte Palomino (Hospital Puerta de Hierro), Alba Bosch Llobet (BST)
ConPlas-19. Multi-center, randomized, clinical trial of convalescent plasma therapy versus standard of care for the treatment of COVID-19 in hospitalized patients
Funding organisation: Carlos III Institute of Health
File: COV20/00072
Duration: 2020 – 2021

Principal investigator: Miguel Lozano Molero (Hospital Clínic), Joan Ramon Grífols Ronda (BST)
Plasma exchange in patients with COVID-19 disease and invasive mechanical ventilation: a randomized study
Funding organisation: Carlos III Institute of Health
File: 2020-001722-66
Duration: 2020

Principal investigator: Oriol Mitjà Villar (FLSIDA), Joan Ramon Grífols Ronda (BST)
COnV-ert. Convalescent methylene blue treated plasma for early treatment in non-hospitalised mild or moderate COVID-19 patients: a randomized double blind study
Funding organisation: FLSIDA
File: NCT04621123
Duration: 2020 -2021

Principal investigator: Silvia Vidal Alcorisa (Hospital de Sant Pau), Pável Olivera Sumire (BST)
Regulation of the immune response by the eltrombopag-induced binding of platelets to circulating leukocytes
Funding organisation: Novartis Pharma AG
File: IIBSP-ITP-2018-65
Duration: 2020 – 2021

Principal investigator: Inmaculada Roldán Rabadán (Hospital La Paz), Pável Olivera Sumire (BST)
RE-BELD Study. Non-Interventional, cross-sectional study to describe novel oral anticoagulants management in elderly patients with non-valvular atrial fibrillation in Spain.
Funding organisation: Boehringer Ingelheim
File: RE-BELD 1160-0297
Duration: 2019 - 2020

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2.2. Cell therapy programme

The aim is for cell therapy in the BST to constitute a platform for knowledge and cell production for the Catalan healthcare system, with the ambition of providing the appropriate response to the needs of patients and the doctors who treat them.

The BST aims to facilitate the introduction of new advanced therapies in the health system, making the clean rooms of the BST available to research clinicians who need to perform concept tests.

Moreover, the BST wants to scale the products and take on the challenge of bioreactor production, in the development of clinical trials, jointly with the Spanish Medicines Agency, among others.

The Cell Therapy Service has its own two lines of development. One is in cellular immunotherapy, with the intention of creating a bank of specific T-cells against the most prevalent viruses among transplant patients. The other is the use of mesenchymal cells from Wharton's jelly in various applications, such as the treatment of graft-versus-host disease and the induction of osteogenesis.

Director
Sergi Querol Giner

Researchers
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Míriam Aylagas García
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Emma Enrich Rande
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Elena Pasamar Garijó
Luciano Rodríguez Gómez
Raquel Rojas Marquez
Francesc Rudilla Salvador
Dinara Samarkanova
Joaquim Vives Armengol

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Research projects

Projects with PI or CO-PI from the BST

Principal investigator: Joan Garcia López
Pericardial matrix with mesenchymal stem cells for the treatment of patients with infarcted myocardial tissue
Funding organisation: Ministry of Science, Innovation and Universities
File: SAF2017-84324-C2-2-R
Duration: 2018 - 2021

Principal investigator: Sergi Querol Giner
iPS-PANIA: Allogeneic IPSCs from homozygous umbilical cord blood units for high-prevalence haplotypes
Funding organisation: Ministry of Science, Innovation and Universities
File: RTC-2017-6000-1
Duration: 2018 - 2021

Principal investigator: Sergi Querol Giner
T-CELBANC: Creation of a national bank of specific T lymphocytes for immediate use in opportunistic post-transplant infections
Funding organisation: Ministry of Science, Innovation and Universities
File: 2017-6368-1
Duration: 2018 – 2021

Principal investigator: Joaquim Vives Armengol
Translation of an allogenic tissue engineering product with mesenchymal stem cells from Wharton Jelly for the treatment of osteonecrosis in paediatric oncology patients
Funding organisation: Carlos III Institute of Health
File: PI19/01788
Duration: 2020 – 2022

Principal investigator: Joaquim Vives Armengol
Fibrin Sealant Grifols as scaffold in advanced therapies. 3D printing scaffolds for advanced trauma applications. In vivo study
Funding organisation: Grífols
File: I.2016.035
Duration: 2017 - 2021

Principal investigator: Francesc Rudilla Salvador
Generation of virus-specific T-cells to prevent and treat herpesvirus infections after allogeneic hematopoietic stem cell transplantation
Funding organisation: BST
File: I.2018.30
Duration: 2018 - 2021

Principal investigator: Francesc Rudilla Salvador
Monitoring of immunotherapy by massive sequencing technology
Entidad financiadora: BST
Expediente: I.2019.041
Duración: 2019 - 2022

Principal investigator: Ruth Coll Bonet
Safety of a double infusion of Wharton's jelly mesenchymal cells in spinal cord injury
Funding organisation: BST
File: I.2017.052
Duration: 2017 – 2020

Principal investigator: Sergi Querol Giner
Cellular immunological response to SARS-COV2. Decisions on the immunization of T-cells and their use in potential therapy
Funding organisation: Cellnex Telecom, S.A.
File: I.2020.038
Duration: 2020 – 2021

Principal investigator: Sergi Querol Giner
COVIDMES: Double-blind, randomized, parallel, and placebo-controlled pilot clinical trial to evaluate the efficacy and safety of two doses of Wharton's jelly mesenchymal stem cells in patients with acute respiratory distress syndrome secondary to COVID-19 infection
Funding organisation: BST
File: 2020-001505-22
Duration: 2020 - 2021

Principal investigator: Jesús Fernandez Sojo
Impact of cryopreservation on clinical outcomes of allogeneic hematopoietic stem cell transplantation during the COVID-19 pandemic
Funding organisation: BST
File: I.2020.047
Duration: 2020

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Collaboration projects

Principal investigator: Claudia Valverde Morales (VHIO), Sergi Querol Giner (BST)
A Phase 2 Single Arm Open-Label Clinical Trial of ADP-A2M4 SPEAR™ T cells in subjects with Advanced Synovial Sarcoma or Myxoid/Round Cell Liposarcoma
Funding organisation: Adaptimmune LLC
File: 2019-000589-39
Duration: 2020

Principal investigator: Joan Vidal Samsó (Institut Guttmann), Ruth Coll Bonet (BST)
A safety, randomized, double-blind, two therapeutic doses and placebo-controlled clinical trial for the treatment of incomplete cervical spinal cord injury with multiple intrathecally infusions of Wharton Jelly mesenchymal stem cells
Funding organisation: Carlos III Institute of Health
File: PI19/01680
Duration: 2020 - 2022

Principal investigator: Elena Elez Fernandez (VHIO), Rafael Parra Lopez (BST)
A single arm Phase I-II multicenter trial with avelumab plus autologous dendritic cell vaccine to determine safety and preliminary efficacy of the combination in pre-treated mismatch repair-proficient (MSS) metastatic colorectal cancer patients
Funding organisation: Spanish Multidisciplinary Group on Digestive Cancer
File: 2016-003838-24
Duration: 2018 – 2020

Principal investigator: Susana Rives Sola (Hospital Sant Joan de Déu), Sergi Querol Giner (BST)
A phase II trial of tisagenlecleucel in first-line high-risk pediatric and young adult patients with B-cell acute lymphoblastic leukemia who are minimal residual disease positive at the end of consolidation therapy
Funding organisation: Novartis Pharma AG
File: 2017-002116-14
Duration: 2018 – 2020

Principal investigator: Pere Barba Suñol (Hospital Vall d'Hebron), Rafael Parra Lopez (BST)
A phase II, single-arm, multi-cohort, multicentre trial to evaluate the efficacy and safety of JCAR017 in adult subjects with aggressive B-cell non-Hodgkin lymphoma
Funding organisation: Celgene Corporation
File: 2017-000106-38
Duration: 2018 – 2020

Principal investigator: Susana Rives Sola (Hospital Sant Joan de Déu), Enric Garcia Rey (BST)
A phase Ib/II, multicentre, open-label, single-arm, multicohort study to evaluate the safety and efficacy of JCAR017 in paediatric patients with acute B-cell lymphoblastic leukaemia and relapsed/refractory B-cell non-Hodgkin lymphoma
Funding organisation: Celgene Corporation
File: 2018-001246-34
Duration: 2018 - 2020

Principal investigator: Ferran Pellisé Urquiza (Hospital Vall d'Hebron), Joaquim Vives Armengol
A combinatorial treatment of neural precursor cells and a new Fasudil nanoconjugate for clinical application in acute spinal cord injury
Funding organisation: TV3 Marathon Foundation
File: 384/C/2017
Duration: 2018 - 2020

Principal investigator: Alena Gros Vidal (Hospital Vall d'Hebron), Sergi Querol Giner (BST)
Cell therapy with TILs for patients with solid tumours: preclinical expansion, validation and sending of IMPD/clinical trial to AEMPS
Funding organisation: BST
File: I.2018.028
Duration: 2018 – 2021

Principal investigator: Susana Rives Solà (Hospital Sant Joan de Déu), Sergi Querol Giner (BST)
A phase I open-label, non-comparative study for evaluating the safety of UCART19 and its ability to induce molecular remission in paediatric patients with recurrent/refractory acute B-cell lymphoblastic leukaemia
Funding organisation: Institut de Recherches Internationales Servier
File: 2015-004293-15
Duration: 2019 - 2020

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Collaboration projects

Principal investigator: Cristina Diaz Heredia (Hospital Vall d'Hebron), Sergi Querol Giner (BST)
A phase II, open-label, multicentre, single-arm study for determining the safety and efficacy of tisagenlecleucel in paediatric patients diagnosed with relapsed/refractory mature non-Hodgkin's lymphoma
Funding organisation: Novartis Pharma AG
File: 2017-005019-15
Duration: 2019 - 2020

Principal investigator: Cristina Diaz Heredia (Hospital Vall d'Hebron), Sergi Querol Giner (BST)
A phase III, registry, multicentre, randomised trial, involving the transplantation of NiCord®, stem cells and progenitors derived from umbilical cord blood expanded ex vivo, versus non-manipulated umbilical cord blood in patients with malignant hematologic neoplasms
Funding organisation: Gamida Cell Ltd
File: 2016-000704-28
Duration: 2018 – 2020

Principal investigator: Juan Martin Liberal (ICO Duran i Reynals), Sergi Querol Giner (BST)
A phase II, multicentre trial with tumour-infiltrating T lymphocytes (LN-144 or LN-145) in patients with solid tumours
Funding organisation: Lion Biotechnologies, Inc.
File: 2018-001608-12
Duration: 2019 - 2020

Principal investigator: Anna Sureda Balari (ICO Duran i Reynals), Sergi Querol Giner (BST)
Tisagenlecleucel versus standard treatment in adult patients with aggressive relapsed/ refractory non-Hodgkin B-cell lymphoma: phase III, open-label, randomised trial
Funding organisation: Novartis Pharma AG
File: 2016-002966-29
Duration: 2019 - 2020

Principal investigator: Enriqueta Felip Font (VHIO), Sergi Querol Giner (BST)
A randomized pilot phase Ib/IIa trial for evaluating the safety and tolerability of NY-ESO-1/LAGE-1a-specific autologous TCRs (GSK3377794) alone or in combination with Pembrolizumab in HLA-A2 + participants with advanced or recurrent NY-ESO-1- or LAGE-1a-Positive lung cancer
File: 2018-003949-42
Funding organisation: GlaxoSmithKline Research & Development Ltd
Duration: 2019 - 2020

Principal investigator: Enriqueta Felip Font (VHIO), Sergi Querol Giner (BST)
An open-label, multicentre phase I/IIa trial for evaluating the safety and clinical activity of neoantigen-reactive T cells in patients with advanced non-microcytic lung carcinoma
File: 2018-001005-85
Funding organisation: Achilles Therapeutics Limited
Duration: 2019 - 2020

Principal investigator: Pere Barba Suñol (Hospital Vall d'Hebron), Sergi Querol Giner (BST)
A phase I/II, multicentre, open-label, single-group trial for evaluating the safety and clinical activity of AUTO3, a T-CAR lymphocyte treatment targeted at CD19 and CD22, and a consolidation treatment with an antibody versus PD-1 in patients with relapsed or refractory diffuse large B-cell lymphoma
File: 2016-004682-11
Funding organisation: Autolus Limited
Duration: 2019 – 2020

Principal investigator: Elena Elez Fernandez (Hospital Vall d'Hebron), Sergi Querol (BST)
A Phase II clinical trial comparing the efficacy of RO7198457 versus watchful waiting in patients with ctDNA-positive, resected Stage II (high risk) and Stage III colorectal càncer
File: 2020-000451-12
Funding organisation: BioNTech SE
Duration: 2020 – 2021

Principal investigator: Pere Barba Suñol (Hospital Vall d'Hebron), Sergi Querol Giner (BST)
Phase I, open label, multicenter, dose escalation study of YTB323 in adult patients with CLL/SLL and DLBCL
File: 2018-004336-30
Funding organisation: Novartis Pharma AG
Duration: 2020 - 2021

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Principal investigator: Josep Tabernero Caturia (Hospital Vall d'Hebron), Sergi Querol Giner (BST)
A phase II open-label study with the anti-PD-L1 Atezolizumab monoclonal antibody in combination with Bevacizumab in patients with advanced chemotherapy resistant colorectal cancer and MSI-like molecular signature
File: 2016-002001-19
Funding organisation: European Commission
Duration: 2019 - 2020

Principal investigator: Antoni Torres Martí (Hospital Clínic), Sergi Querol (BST)
Identification of epitopes and isolation of IgG anti-COVID-19 to produce monoclonal antibodies for treatment
File: I.2020.029
Funding organisation: BIOCAT
Duration: 2020

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Samarkanova D, Cox S, Hernandez D, **Rodríguez L**, **Casaroli-Marano RP**, **Madrigal A**, **Querol S.** Cord Blood Platelet Rich Plasma Derivatives for Clinical Applications in Non-transfusion Medicine. FRONT IMMUNOL 2020 May 27;11:942. QUARTILE 1, IF 5.085

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Publications

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Castella M, Caballero-Baños M, Ortiz-Maldonado V, González-Navarro EA, Suñé G, Antoñana-Vidósola A, Boronat A, Marzal B, Millán L, Martín-Antonio B, Cid J, Lozano M, **García E**, **Tabera J**, Trias E, Perpiña U, Canals JM, Baumann T, Benítez-Ribas D, Campo E, Yagüe J, Urbano-Ispizua Á, Rives S, Delgado J, Juan M. Point-Of-Care CAR T-Cell Production (ARI-0001) Using a Closed Semi-automatic Bioreactor: Experience From an Academic Phase I Clinical Trial. FRONT IMMUNOL 2020 Mar 20;11:482. QUARTILE 1, IF 5.085

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Albu S, Kumru H, **Coll R**, Vallés M, **Vives J**, Benito-

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Fournier D, Lewin A, Simard C, Trépanier P, Néron S, Ballerini L, **Codinach M**, Elmoazzen H, Halpenny M, Kogler G, Liedtke S, Louis I, **Molluna CA**, Pineault N, Prasath A, **Querol S**, Saccardi R, Sutherland DR, Thérien C, Urbani S. Multi-laboratory assay for harmonization of enumeration of viable CD34+ and CD45+ cells in frozen cord blood units. CYTOTHERAPY 2020 Jan;22(1):44-51. QUARTILE 1, IF 4.218

Ortí G, Palacio-Garcia C, García-Cadenas I, Sanchez-Ortega I, Jimenez MJ, **Azqueta C**, Villacampa G, Ferrà C, Parody R, Martino R, Bosch F, **Querol S**, Valcárcel D. Analysis of Cell Subsets in Donor Lymphocyte Infusions from HLA Identical Sibling Donors after Allogeneic Hematopoietic Cell Transplant. BIOL BLOOD MARROW TRANSPLANT 2021 Jan;27(1):53.e1-53.e8. QUARTILE 2, IF 3.853

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De Frutos AG, González-Tartière P, Coll R, Ubierna-Garcés MT, Del Arco-Churruca A, Rivas-García A, Matamalas-Adrover A, Saló-Bru G, Velazquez JJ, Vila-Canet G, **García-López J**, **Vives J**, **Codinach M**, **Rodríguez L**, Bagó-Granell J, Cáceres-Palou E. Randomized clinical trial: Expanded autologous bone marrow mesenchymal cells combined with allogenic bone tissue, compared with autologous iliac crest graft in lumbar fusion surgery. The Spine Journal 2020, 1899-1910. QUARTILE 1, IF 3.191

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Ramallo M, Carreras-Sánchez I, López-Fernández A, Vélez R, Aguirre M, Feldman S, **Vives J.** Advances in translational orthopaedic research with species-specific multipotent mesenchymal stromal cells derived from the umbilical cord. HISTOL HISTOPATHOL 2021 Jan;36(1):19-30. QUARTILE 3, IF 2.021

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2.3. Tissue Bank programme

The programme of the Banc de Teixits is focused on translational research, as well as the development, optimisation and innovation of procedures and techniques aimed at improving the usefulness, quality and safety of human cells and tissues, for therapeutic or biosubstitutive purposes.

Researchers also have a coordinating role for projects, analysing their viability and, when possible, raising resources for their development through competitive public grants (Spain and the European Community), private entities and foundations and in the business field related to the sector.

Our research programme enhances self-sustainability and innovation based on collaboration with the business sector in coordination with leading translational research clinical groups in the national and international context.

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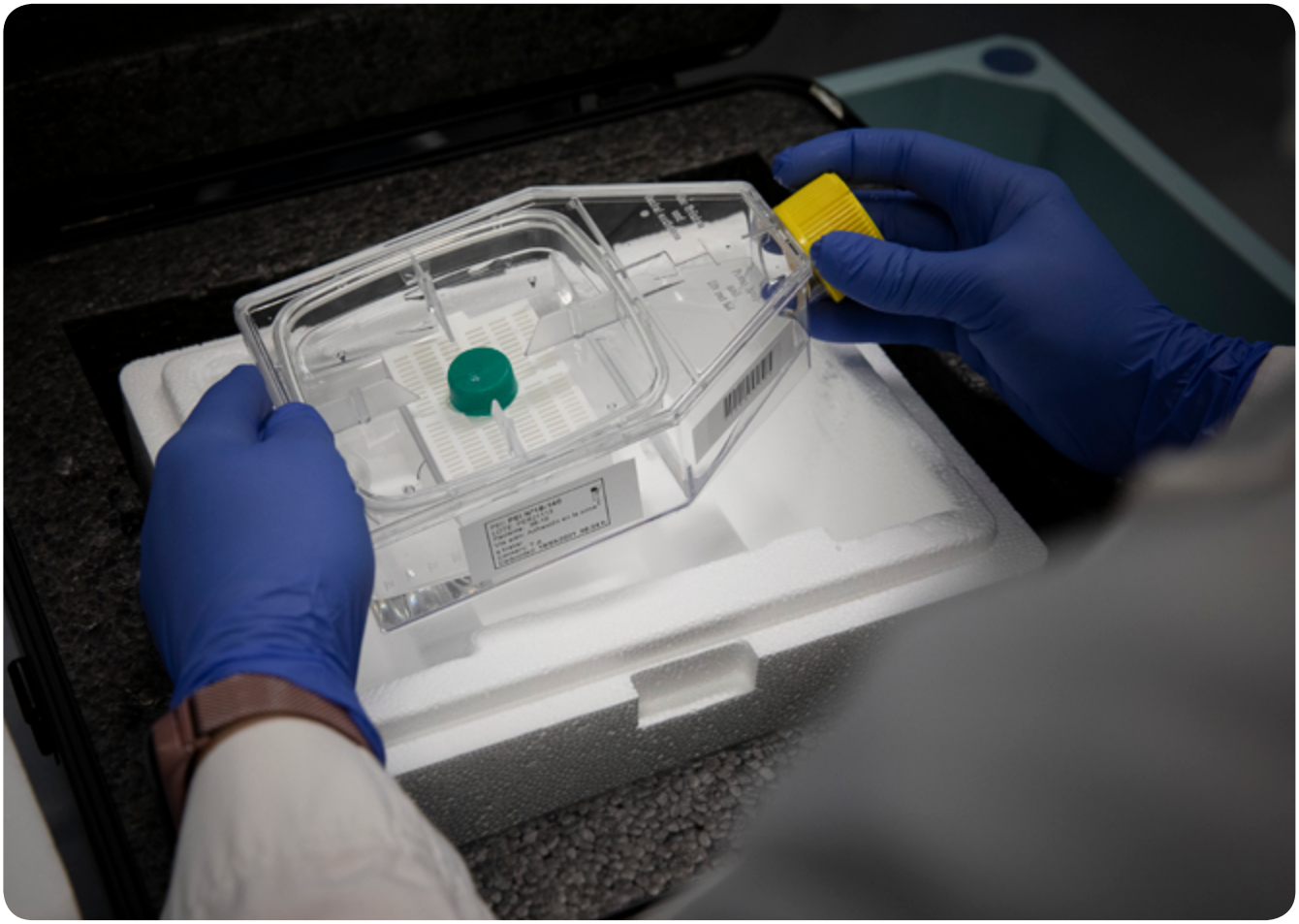
Translational research is a tool for continuous improvement and focused on responding to therapeutic indications, through the use of effective and appropriate approaches and procedures.

The strategy of our R+D+i programme thus enhances the different lines of research regarded as strategic for the organization, taking into account other aspects, such as the fact that our first priority is the patient. And as fundamental pillars of all this, we have the ethical and regulatory framework, the quality and excellence, as well as the commitment to sustainability.

Director
Ricardo P Casaroli Marano

Researchers
Elba Agustí Robira
Caterina Aloy Reverte
Cristina Castells Sala
Oscar Fariñas Barbera
Patricia Lopez Chicon
Laura López Puerto
Nuria Nieto Nicolau
Nausica Otero Areitio
Marisa Pérez Rodriguez
Aida Rebollo Morell
Tatiana Riba Tietz
José Ignacio Rodríguez Martínez
Andres Savio Lopez
Jaime Tabera Fernandez
Anna Vilarrodona Serrat



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Research projects

Projects with PI or CO-PI from the BST

Principal investigator: Ricardo Casaroli Marano
Induced pluripotent cells and cell reprogramming in cell-based approaches for corneal regeneration
Funding organisation: Carlos III Institute of Health
File: PI18/00355
Duration: 2019 -2021

Principal investigator: Oscar Fariñas Barberà and Pablo Gelber (Hospital de Sant Pau)
Fresh preservation of osteochondral allografts at 37°C
Funding organisation: Carlos III Institute of Health
File: PI18/01771
Duration: 2019 -2021

Principal investigator: Patricia Lopez Chicon
Optimisation of the conditions of products intended for tissue transplantation
Funding organisation: BST
File: I.2017.038
Duration: 2017 - 2021

Principal investigator: Marisa Perez Rodriguez
A study of the biological properties of a dermal matrix of human origin for its application in pelvic organ prolapse correction surgeries
Funding organisation: BST
File: I.2017.039
Duration: 2017 - 2020

Principal investigator: Núria Nieto Nicolau
Obtaining decellularised nerve matrix for the regeneration of peripheral nerves
Funding organisation: BST
File: I.2017.055
Duration: 2017 - 2020

Principal investigator: Cristina Castells Sala
Development of a heart valve decellularisation method to be used in valve replacement surgeries
Funding organisation: BST
File: I.2018.027
Duration: 2018 – 2021

Principal investigator: Caterina Aloy Reverte
Development of a keratinocyte spray for the treatment of large burns
Funding organisation: BST
File: I.2019.028
Duration: 2020

Principal investigator: Ricardo Casaroli Marano
Application of cell reprogramming and induced pluripotent progenitor cells for regeneration of the ocular surface
Funding organisation: BST
File: I.2019.029
Duration: 2020

Principal investigator: Cristina Castells Sala
Decellularized and re-endothelialized vascular graft for use in coronary bypass surgery
Funding organisation: BST
File: I.2019.030
Duration: 2020 - 2021

Principal investigator: Marisa Perez Rodriguez
Rotator cuff repair with dermal matrix patch from the tissue bank
Funding organisation: BST
File: I.2019.038
Duration: 2020 – 2021

Principal investigator: Anna Vilarrodona Serrat
Reduction of post-infarction lesion by bioimplants with reparative capabilities: biomimetic hydrogels and extracellular vesicles for cardiac regenerative medicine
Funding organisation: BST
File: I.2019.039
Duration: 2020 - 2021

Principal investigator: Oscar Fariñas Barberà
Development of bioinks for application to 3D bioprinting in the osteochondral field
Funding organisation: BST
File: I.2019.042
Duration: 2020 - 2021

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Collaboration projects

Principal investigator: Francisco Fernandez Avilés (Hospital Gregorio Marañón), Patricia Lopez Chicón (BST)
Safety and efficacy of the intracoronary administration of allogeneic heart stem cells in patients with ischemic heart failure with a high risk of sudden death
Funding organisation: Carlos III Institute of Health
File: PIC18/00024
Duration: 2019 - 2022

Publications

Nieto-Nicolau N, de la Torre RM, **Fariñas O**, **Savio A**, **Vilarrodona A**, **Casaroli-Marano RP.** Extrinsic modulation of integrin α6 and progenitor cell behavior in mesenchymal stem cells. STEM CELL RES 2020 Jun 30;47:101899. QUARTILE 1, IF 4.489

Nieto-Nicolau N, Martín-Antonio B, Müller-Sánchez C, **Casaroli-Marano RP.** In vitro Potential of Human Mesenchymal Stem Cells for Corneal Epithelial Regeneration. REGEN MED 2020 Mar;15(3):1409-1426. QUARTILE 2, IF 2.598

Trias E, Nijs M, Rugescu IA, Lombardo F, Nikolov G, Provoost V, Tolpe A, Vermeulen N, Veleva Z, **Piteira R**, **Casaroli-Marano R**, Tilleman K; EuroGTP II Study Group. Evaluating risk, safety and efficacy of novel reproductive techniques and therapies through the EuroGTP II risk assessment tool. HUM REPROD 2020 Aug 1;35(8):1821-1838. QUARTILE 1, IF 5.733

Garcia-Medina JJ, Rubio-Velazquez E, Foulquie-Moreno E, **Casaroli-Marano RP**, Pinazo-Duran MD, Zanon-Moreno V, Del-Rio-Vellosillo M. Update on the E ects of Antioxidants on Diabetic Retinopathy: In Vitro Experiments, Animal Studies and Clinical Trials. ANTIOXIDANTS (Basel). 2020 Jun 26;9(6):561. QUARTILE 1, IF 5.014

Méndez-Lara KA, Letelier N, Farré N, Diarte-Añazco EMG, Nieto-Nicolau N, Rodríguez-Millán E, Santos D, Pallarès V, Escolà-Gil JC, Vázquez Del Olmo T, Lerma E, Camacho M, **Casaroli-Marano RP**, Valledor AF, Blanco-Vaca F, Julve J. Nicotinamide Prevents Apolipoprotein B-Containing Lipoprotein Oxidation, Inflammation and Atherosclerosis in Apolipoprotein E-Deficient Mice. ANTIOXIDANTS (Basel) 2020 Nov 21;9(11):1162. QUARTILE 1, IF 5.014

Iglesias M, Yebra F, Kudsieh B, Laiseca A, Santos C, Nadal J, Barraquer R, **Casaroli-Marano RP.** New applanation tonometer for myopic patients after laser refractive surgery. SCI REP 2020 Apr 27;10(1):7053. QUARTILE 1, IF 3.998

Figueras-Roca M, Parrado-Carrillo A, Nguyen V, **Casaroli-Marano RP**, Moll-Udina A, Gillies MC, Barthelmes D, Zarranz-Ventura J. Treat-and-extend versus fixed bimonthly treatment regimens for treatment-naive neovascular age-related macular degeneration: real world data from the Fight Retinal Blindness registry. GRAEFES ARCH CLIN EXP OPHTHALMOL 2020 Nov 20. doi: 10.1007/s00417-020-05016-9. QUARTILE 2, IF 2.396

Sabater-Cruz N, Dotti-Boada M, Rios J, Carrion MT, Chamorro L, Sánchez-Dalmau BF, **Casaroli-Marano RP.** Postoperative treatment compliance rate and complications with two different protocols after pterygium excision and conjunctival autografting. EUR J OPHTHALMOL 2020 Apr 27:1120672120917335. QUARTILE 3, IF 1.642

Yamamoto-Rodríguez L, Zarbin MA, **Casaroli-Marano RP.** New Frontiers and Clinical Implications

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in the Pathophysiology of Age-Related Macular Degeneration. MED CLIN (BARC) 2020 Jun 26;154(12):496-504. QUARTILE 3, IF 1.635

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Erivan R, **Lopez-Chicon P**, **Fariñas O**, Perez Prieto D, Grau S, Boisgard S, Monllau JC, **Vilarrodona A.** Which Type of Bone Releases the Most Vancomycin? Comparison of Spongious Bone, Cortical Powder and Cortico-Spongious Bone. CELL TISSUE BANK 2020 Mar;21(1):131-137. QUARTILE 4, IF 1.149

Sabater-Cruz N, Figueras-Roca M, González Ventosa A, Padró-Pitarch L, Tort J, **Casaroli-Marano RP.** Current clinical application of sclera and amniotic membrane for ocular tissue bio-replacement. CELL TISSUE BANK 2020 Dec;21(4):597-603. QUARTILE 4, IF 1.149

Trias E, Gallon P, Ferrari S, **Piteira AR**, **Tabera J**, **Casaroli-Marano RP**, Parekh M, Ruzza A, Franch A, Ponzin D. Banking of Corneal Stromal Lenticules: A Risk-Analysis Assessment With the EuroGTP II Interactive Tool. CELL TISSUE BANK 2020 Jun;21(2):189-204. QUARTILE 4, IF 1.149

Moll-Udina A, Alforja-Castiella S, Figueroa-Vercellino JP, Alé-Chilet A, **Casaroli-Marano RP.** Simultaneous retinal pigment epithelium tear and lamellar macular hole evolving to a full-thickness macular hole after intravitreal injection. J FR OPHTALMOL 2020 Sep;43(7):e237-e239. QUARTILE 4, IF 0.636

2.4. Biological safety programme

The Transfusion Safety Laboratory (LST from its Spanish initials) aims to improve the pathophysiological, epidemiological and detection knowledge of infectious agents relevant to the safety of blood, cells, tissues and breast milk.

In this respect, one must highlight the activity developed to improve knowledge of the presence of pathogens from other countries among the reference Catalan population of the BST.

Studies in this direction are aimed at planning and establishing strategies to ensure the safety of blood products on the basis of a correct selection of blood donors and the application of diagnostic tests. It should be borne in mind that the BST is the only centre that distributes blood products in Catalonia and its direct responsibility is to maintain and promote research along these lines.

The Transfusion Safety Laboratory (LST) is made up of the Care Unit and the R&D Unit in transmissible agents. The R&D activity of the LST has two main lines:

A. Viral hepatitis (HBV, HCV and HEV) and HIV coinfection
B. Epidemiological research and development of new tools for the detection of emerging infectious agents (Chagas disease, HTLV-I/II, Chikungunya virus, malaria, XMRV, ZIKA)

Director
Sílvia Sauleda Oliveras

Researchers
Marta Bes Maijó
Maria Costafreda Salvany
Meritxell Llorens Revull
Maria Piron

Support staff
Angeles Rico Blázquez

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Research projects

Projects with a PI or CO-PI from the BST

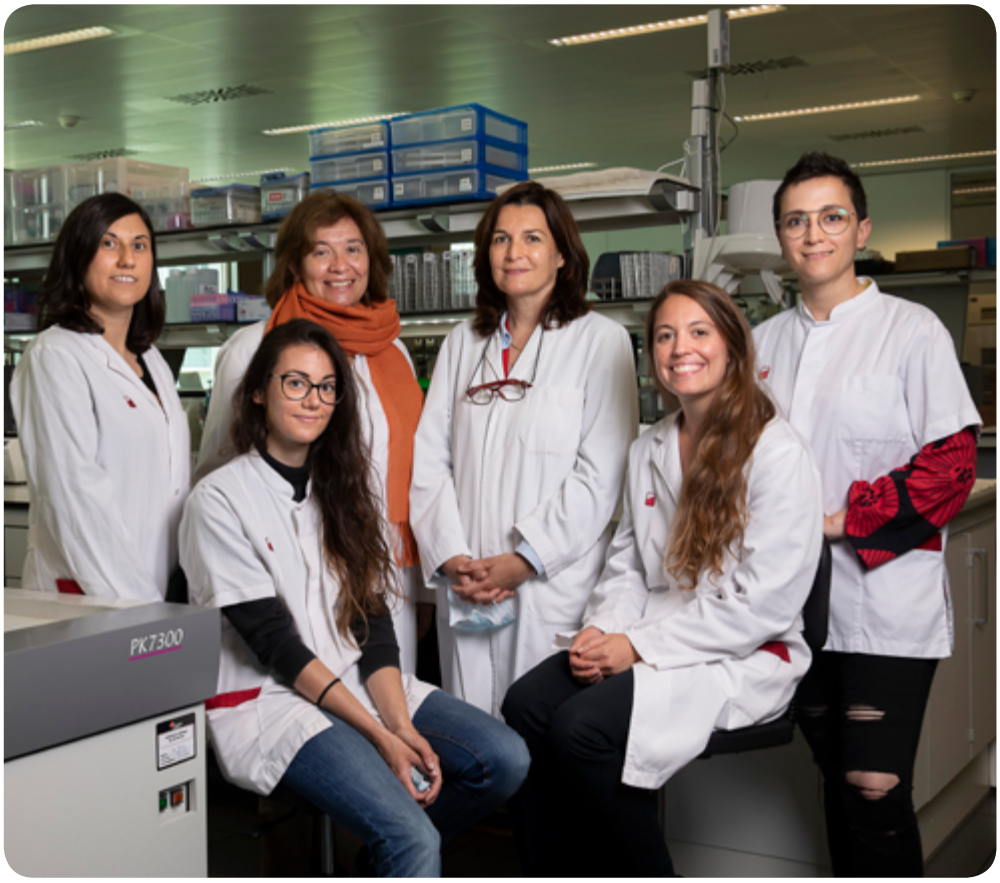
Principal investigator: Maria Piron
Development of real-time PCR protocols (ZIKA, Dengue, Chikungunya, HTLV-I, HTLV-II, etc.) as supplementary screening or analysis tools for emerging infectious pathogens and a field study of emerging pathogens in high-risk travellers and immigrant donors
Funding organisation: BST
File: I.2016.037
Duration: 2009 - 2020

Principal investigator: Marta Bes Maijó
Epidemiological and pathophysiological evaluation of hepatitis E virus infection among blood donors
Funding organisation: BST
File: I.2017.051
Duration: 2017 – 2020

Principal investigator: Maria Piron
Determination of anti-SARS-CoV-2 antibodies in asymptomatic adult population: prevalence and persistence in blood donors from Catalonia
Funding organisation: BST
File: I.2020.030
Duration: 2020

Principal investigator: Maria Costafreda Salvany
Prevalence of HIV Pre-Exposure Prophylaxis & hepatitis A virus antibodies as surrogate markers of undisclosed high-risk sexual practices among blood donors in Catalonia
Funding organisation: BST
File: I.2019.031
Duration: 2020 - 2022

Principal investigator: Maria Piron
Long-term monitoring of the prevalence of anti-SARS-CoV-2 antibodies in blood donors from Catalonia
Funding organisation: BST
File: I.2020.063
Duration: 2020 - 2021



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Collaboration projects

Principal investigator: Celia Perales Viejo (Hospital Vall d'Hebron), Sílvia Sauleda Oliveras (BST)
Exosomes as biomarkers of liver disease progression after hepatitis C virus cure
Funding organisation: Carlos III Institute of Health
File: PI18/00210
Duration: 2019 - 2021

Principal investigator: Juan Ignacio Esteban Mur (Hospital Vall d'Hebron), Sílvia Sauleda Oliveras (BST)
Dynamic changes in HCV-specific immune response during and after DAAs treatment to unravel new approaches to prophylactic vaccine development
Funding organisation: Carlos III Institute of Health
File: PI19/00533
Duration: 2020 - 2022

Publications

Costafreda MI, Abbasi A, Lu H, Kaplan G. Exosome mimicry by a HAVCR1–NPC1 pathway of endosomal fusion mediates hepatitis A virus infection. NAT MICROBIOL 2020 Sep;5(9):1096-1106. QUARTILE 1, IF 15.540

Chen Q, Perales C, Soria ME, García-Cehic D, Gregori J, Rodríguez-Frías F, Buti M, Crespo J, Calleja JL, Tabernero D, Vila M, Lázaro F, Rando-Segura A, Nieto-Aponte L, Llorens-Revull M, Cortese MF, Fernandez-Alonso I, Castellote J, Niubó J, Imaz A, Xiol X, Castells L, Riveiro-Barciela M, Llaneras J, Navarro J, Vargas-Blasco V, Augustin S, Conde I, Rubín Á, Prieto M, Torras X, Margall N, Forns X, Mariño Z, Lens S, Bonacci M, Pérez-Del-Pulgar S, Londoño MC, García-Buey ML, Sanz-Cameno P, Morillas R, Martró E, Saludes V, Masnou-Ridaura H, Salmerón J, Quíles R, Carrión JA, Forné M, Rosinach M, Fernández I, García-Samaniego J, Madejón A, Castillo-Grau P, López-Núñez C, Ferri MJ, Durández R, Sáez-Royuela F, Diago M, Gimeno C, Medina R, Buenestado J, Bernet A, Turnes J, Trigo-Daporta M, Hernández-Guerra M, Delgado-Blanco M, Cañizares A, Arenas JI, Gomez-Alonso MJ, Rodríguez M, Deig E, Olivé G, Río OD, Cabezas J, Quiñones I, Roget M, Montoliu S, García-Costa J, Force L, Blanch S, Miralbés M, López-de-Goicoechea MJ, García-Flores A, Saumoy M, Casanovas T, Baliellas C, Gilabert P, Martin-Cardona A, Roca R, Barenys M, Villaverde J, Salord S, Camps B, Silvan di Yacovo M, Ocaña I, **Sauleda S**, **Bes M**, Carbonell J, Vargas-Accarino E, Ruzo SP, Guerrero-Murillo M, Von Massow G, **Costafreda MI**, López RM, González-Moreno L, Real Y, Acero-Fernández D, Viroles S, Pamplona X, Cairó M, Ocete MD, Macías-Sánchez JF, Estébanez A, Quer JC, Mena-de-Cea Á, Otero A, Castro-Iglesias Á, Suárez F, Vázquez Á, Vieito D, López-Calvo S, Vázquez-Rodríguez P, Martínez-Cerezo FJ, Rodríguez R, Macenlle R, Cachero A, Mereish G, Mora-Moruny C, Fábregas S, Sacristán B, Albillos A, Sánchez-Ruano JJ, Baluja-Pino R, Fernández-Fernández J, González-Portela C, García-Martin C, Sánchez-Antolín G, Andrade RJ, Simón MA, Pascasio JM, Romero-Gómez M, Antonio Del-Campo J, Domingo E, Esteban R, Esteban JI, Quer J. Deep-sequencing reveals broad subtype-specific HCV resistance mutations associated with treatment failure. ANTIVIRAL RES 2020 Feb;174:104694. QUARTILE 1, IF 4.101

Riveiro-Barciela M, Rando-Segura A, Barreira-Díaz A, **Bes M**, P Ruzo S, **Piron M**, Quer J, **Sauleda S**, Rodríguez-Frías F, Esteban R, Buti M. Unexpected Long-Lasting anti-HEV IgM Positivity: Is HEV Antigen a Better Serological Marker for Hepatitis E Infection Diagnosis? J VIRAL HEPAT 2020 Jul;27(7):747-753. QUARTILE 2, IF 3.561

Forberg K, Rodgers MA, Dawson GJ, **Sauleda S**, Olivo A, Vallari A, **Bes M**, **Piron M**, Cloherty GA, Berg MG. Human pegivirus 2 exhibits minimal geographic and temporal genetic diversity. VIROLOGY 2020 Jan 2;539:69-79. QUARTILE 3, IF 2.819

Berg MG, Olivo A, Forberg K, Harris BJ, Yamaguchi J, Shirazi R, Gozlan Y, **Sauleda S**, Kaptue L, Rodgers MA, Mor O, Cloherty GA. Advanced molecular surveillance approaches for characterization of blood borne hepatitis viruses. PLOS ONE 2020 Jul 17;15(7):e0236046. QUARTILE 2, IF 2.740

2.5. Blood, cell and tissue donation programme

This is a newly created programme in the PER 2017-20.

Directed by Aurora Masip Treig, it aims to develop projects for the improvement of, among other things, our knowledge of donor behaviour and their affective and decision-making mechanisms in order to better adapt donations to therapeutic needs, while preserving the well-being and ethical and social values of donors.

Research will focus on, among other priorities, the study of ethical principles, promotion, donation behaviours and, above all, the protection, well-being and comfort of the donor.

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3. The core platforms

The central or core platforms are shared research resources that provide access to BST researchers and institutions linked to instruments, technologies and services, as well as expert consultations and collaborations.

The BST organisation has fostered the consolidation of these platforms on the basis of the laboratories of the healthcare divisions, taking advantage of their technological capabilities and opening up their own research resources to general use.

3.1. Genome platform

The Banc de Sang i Teixits Genome Platform arose from the growing need to adapt molecular diagnostic protocols to new massive sequencing platforms (NGS) and from the interest in applying this technology to different research and innovation projects. Extensive experience in NGS application development is complemented by a strong support structure in equipment. The platform currently has two next-generation Illumina sequencers, MiSeq and NextSeq 500, which allow great scalability for addressing protocols ranging from the identification of point variants in one or a few genes to the sequencing of complete exomes. The platform's functions include the management and optimisation of the use of NGS technology, and the offering of technical support to researchers who want to apply high-performance genomic analysis techniques to their work in project design and development and in data execution and analysis. In this sense, it is essential to support projects from the outset in order to determine the most appropriate strategy to achieve the objectives.

Director
Irene Corrales Insa

Researchers
Nina Borras Agustí
Natàlia Comes Fernandez
Carlos Hobeich Naya
Francisco Vidal Perez

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3.2. Cell platform

Its functions include the maintenance and provision of the necessary equipment to researchers working in cell culture and characterization (mainly by cytometry, microscopy and metabolism analysis), as well as the basic training needed to make a correct use of it.

Moreover, the experience of the platform's professionals will be used to support and offer added value to the research and assistance activities of BST researchers, including technical support in the design and execution of projects and in data management and analysis.

In summary, the functions of the platform will include: user training, organisation of the uses of the devices and management of incidents, supervision, maintenance and calibration/verification of the devices, the development and updating of Standard Working Procedures, support for users in the design and execution of tests with cells and technological surveillance, among other things.

Director
Gloria Soria Guerrero

Researchers
Francisco Javier Algar Gutierrez
Gemma Aran Canals
Begoña Amill Camps
Margarita Blanco Garcia
Margarita Codinach Creus
Ruth Forner Gómez
Mireia Lloret Sanchez
Daniel Navarro Ruiz
Aroa Pérez Garcia
Isabel Tarragó Canela
Silvia Torrents Zapata

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3.3. Clinical development

The clinical development platform supports BST teams and their collaborators in the development of clinical trials conducted with products generated by their research and those promoted by their public and private collaborators. It is, besides, the channel of communication with regulatory agencies.

Its head is
Dra. Ruth Coll Bonet

3.4. The Biobank

The Banc de Sang i Teixits (BST) Biobank provides the scientific community with the necessary biological material, and in optimal conditions, contributes to its research excellence while guaranteeing the rights of donors.

It began to function on 17 September 2010, with provisional authorisation, and obtained final administrative authorisation on 12 April 2013.

It currently has a transversal structure that manages the transfer of biological samples (blood components, plasma, serum, progenitors, tissues, etc.) between the different departments of the BST and the researchers who request them.

The scientific committee of the Biobank:

Dra. Silvia Sauleda
Head of the Transfusion Safety Laboratory (LST)

Dra. Aurora Navarro
Coordinator of the Notify project

Dr. Eduard Muñiz
Head of the Immunohematology Division

Dr. Francisco Vidal
Head of the Laboratory of Congenital Coagulopathies

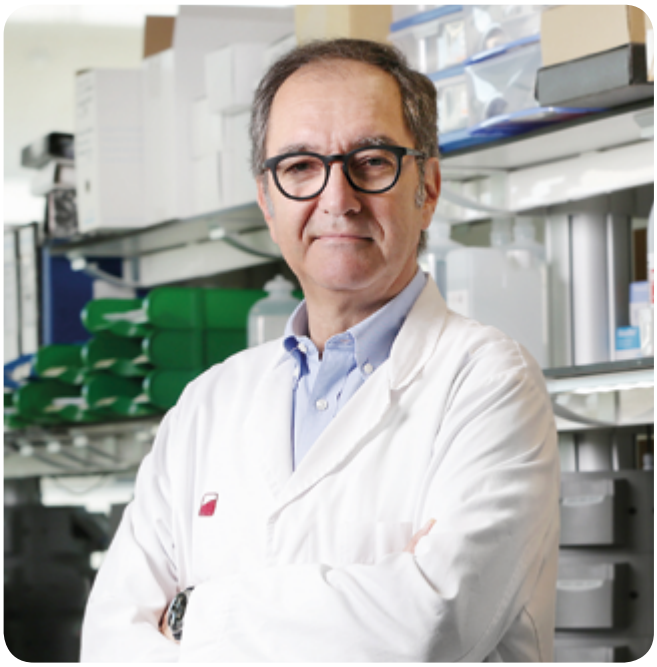
Dr. Sergi Querol
Head of the Cell Therapy Service

The scientific direction of the Biobank:

Dr. Joan Garcia López
Director of Research and Education of the BST

Sra. Pilar Monleón
Coordinator, in charge of managing the transfer of the samples.

Joan Garcia



Pilar Monleon

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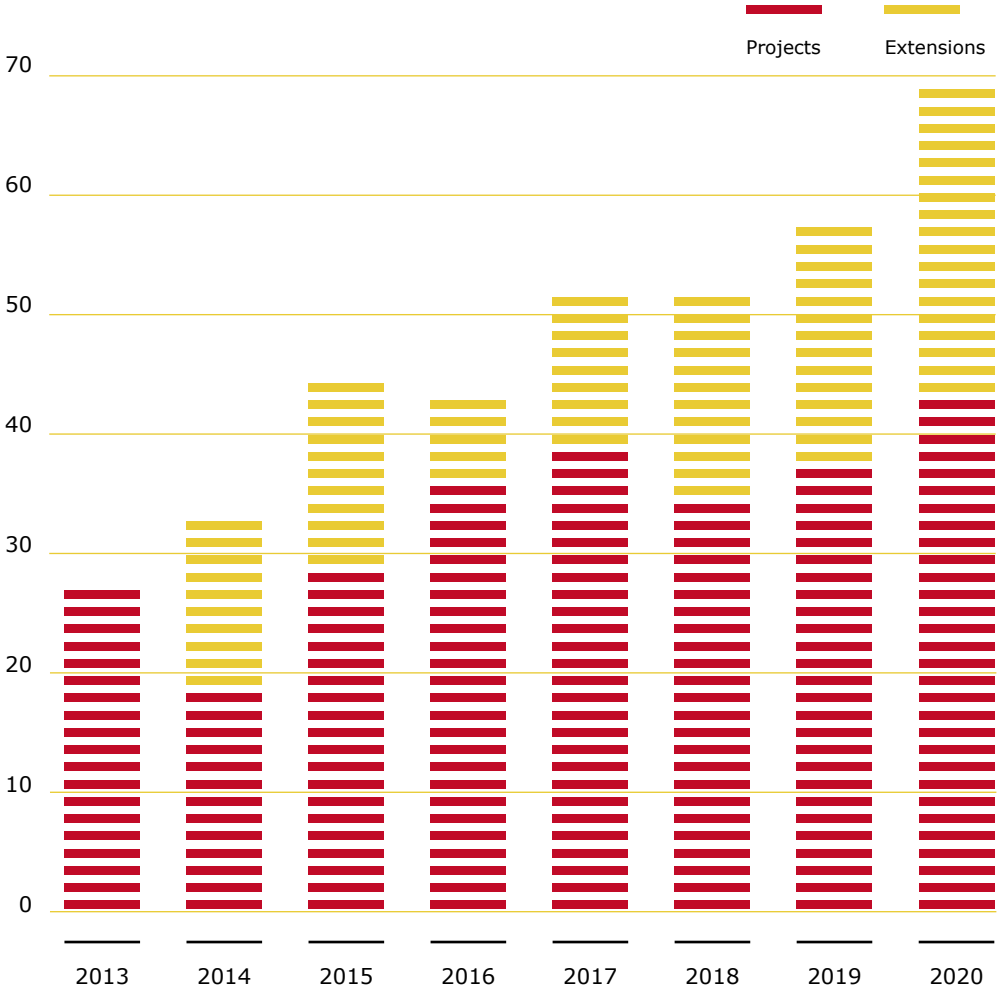
Evolution of the number of projects and extensions since 2013

The BST supply area and its different territorial centres are responsible for the supply of samples to all BST services and departments.

Below is a summary of the Biobank's activity. Detailed information can be found in the specific 2020 report.

Despite the health emergency that we lived through during 2020 and which still continues, 43 new research projects and 26 previously approved extended projects have been approved for sample release.



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21% increase of requests for samples

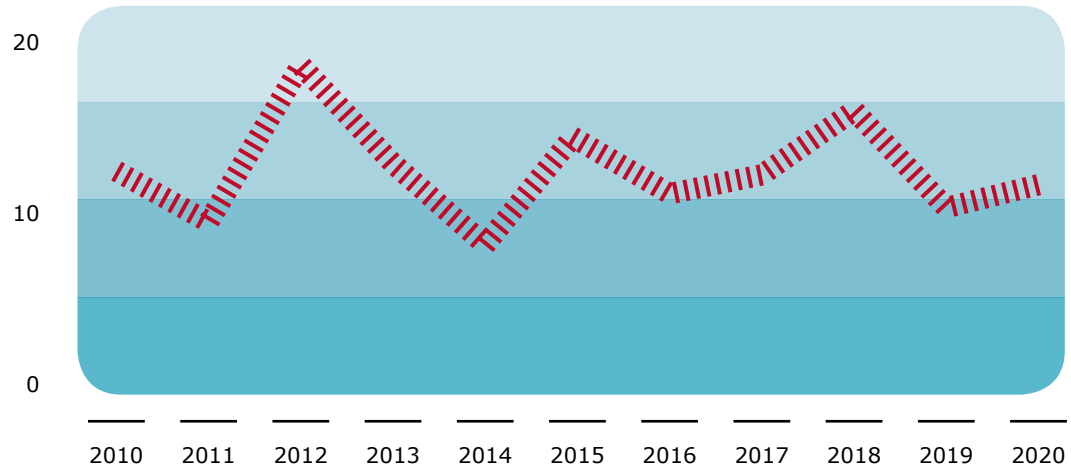
There is a clear increase in the number of requests for samples. More precisely, from 2019 to 2020 there was a 21% increase, but if we compare figures since 2013, requests have almost tripled.

Agreements for the transfer of biological samples are regulated through memorandums of understanding (MoU) with research institutions, universities or companies in the health sector. So far, 135 MoUs have been signed, and their evolution can be seen in the table below:

In fact, during 2020, in addition to the internal projects (9), approval was given to the transfer of samples to 34 new projects with research centres, universities, hospitals and companies and a total of 182,507 samples were supplied.

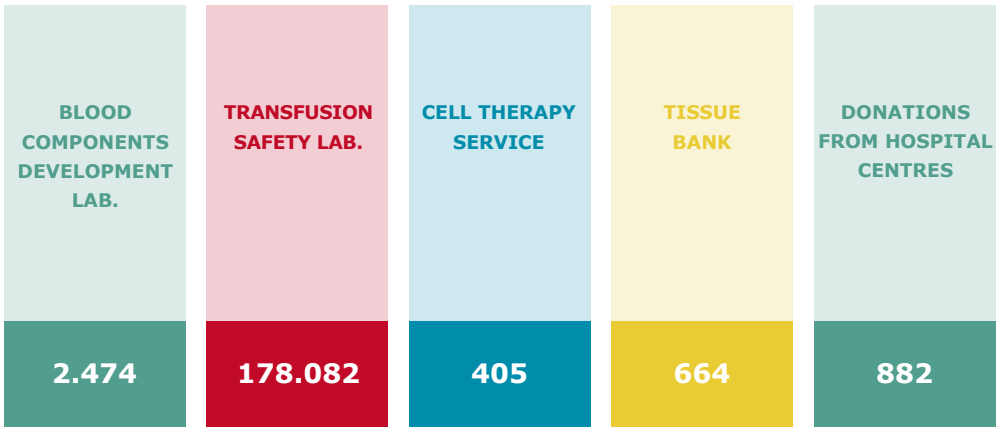
These come from the different BST services shown below, where the number of units delivered is also expressed.

135 collaboration agreements



The samples come from the different services of the BST

182.507 samples were supplied



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358.029€ turnover has grown by 59% compared to the previous year

Comparing the data with 2019, the most notable increase corresponds to the Transfusion Safety Laboratory due to internal projects related to SARS-CoV-2 (71,769 samples). The Cell Therapy Service increased the number of products supplied by 14%, and the territorial centres by almost 13%. However, there was a decrease in the Blood Component Processing Laboratory of 46%.

During 2020, five new products were made available to researchers from the Blood Component Processing Laboratory (1), from the territorial centres (1) and from the Tissue Bank (3)

Finally, the economic activity of the Biobank, with a turnover of €358,029 in 2020, has grown by 59% compared to the previous year (€224,179).

an increase of 158% the Transfusion Safety Laboratory

In relation to the departments supplying the products, the Transfusion Safety Laboratory stands out with an increase of 158%, the Tissue Bank with 56%, the territorial centres with 52%, and the Cell Therapy Service with almost 48%.

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4. Education at the BST

The mission of the BST education area is to promote and collaborate in the training of Health and Life Sciences students and professionals, particularly in the field of transfusion medicine and cell and tissue therapy.

It develops its own teaching and training services and acts as a reference centre for professionals in the sector at a national and international level.

It also manages the MoUs and coordinates and plans residents' training and the training stays of external and internal professionals, as well as handling student internships in the BST's different departments. It is also responsible for the induction all these professionals and students when they arrive at our main centre's facilities.

Due to the pandemic, at the beginning of March, preventive measures at our facilities led to the temporary suspension of all internships. Although they resumed in June, they were suspended again in October.

Resident training was also affected: their rotations were suspended at our main centre (although not at the territorial centres) and, given the exceptional situation facing hospitals, were not resumed until July.

The education area engages in different activities, which can be seen in detail in the 2020 report, aimed at different profile groups:

4.1. Students from other institutions

4.1.1. Schools and institutes

Internships have been carried out by intermediate- and advanced-level vocational training students from the following schools and centres:

- Institut Pedraforca
- Institut Escola Municipal del Treball de Granollers
- Institut la Guineueta
- Escola Jesuïtes del Clot
- Escola Santa Maria dels Apòstols
- Centre d'Estudis Dolmen
- Bemen 3
- Institut Salvador Seguí
- Tau Formar

The training specialisations were: clinical and biomedical laboratory and health documentation and administration. The baccalaureate students came to us from the scientific-technological and humanities-social branches.

4.1.2. Universities

We signed agreements for curricular and extra-curricular internships, final bachelor's degree projects or master's degree internships with the following universities:

- University of Barcelona
- Autonomous University of Barcelona
- Universitat Politècnica de Catalunya-BarcelonaTech
- Pompeu Fabra University
- University of Vic-Central University of Catalonia
- Institut Químic Sarrià-Ramon Llull University
- Campus Docent Sant Joan de Déu
- Universitat Oberta de Catalunya (UOC)

Including students from faculties of Computer Engineering, Biomedical Engineering, Biomedical Sciences, Biology, Biotechnology and Journalism.

By way of example, in 2020, we tutored ten bachelor's degree and nine master's degree students in the following departments: Congenital Coagulopathies, Operations and Engineering, Cell Therapy Service, Transfusion Safety Laboratory, Blood Component Processing Laboratory, Cell Laboratory, Immunohaematology Laboratory, Tissue Bank and Communications Department.

Special mention should be made of the two PhD students in Physics who worked in Congenital Coagulopathies.

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4.2. Medical residents

The BST was accredited as a reference teaching unit for training in haemotherapy for medical residents (studying to take the Spanish MIR certification exam) by the Spanish Ministry of Health and Social Policy on 5 October 2010.

Dr Eduard Muñiz, head of the BST Immunohaematology Laboratory, coordinates this unit and is responsible for evaluating these MIR students' training.

In 2020, 11 MIR students from practically all the hospitals in Catalonia were trained at BST's main centre.

Their rotation lasts two to three months, depending on the hospital of origin, at BST's main centre, and two months in the BST territorial centres. All residents rotate through the following departments:

- Immunohaematology Laboratory
- Red Series
- Platelets
- Molecular Biology
- HLA Laboratory (except for MIR students from Hospital de la Santa Creu i Sant Pau).
- During this stay, they rotate 1 day in Congenital Coagulopathies
- Cell Therapy Service. During this stay they rotate 1 day in the Cell Laboratory
- Blood Component Processing Laboratory
- Transfusion Safety Laboratory
- Quality and Communication Departments
- Territorial centres: Sant Joan de Reus, Virgin of La Cinta-Tortosa, Mutua de Terrassa

In 2020, an internal assessment system was implemented in the Cell Therapy Service (average score 8.7) and the Histocompatibility Laboratory (HLA) (average score 7.96), as these are the laboratories, together with the Immunohaematology Laboratory, where residents spend the most time.

We interviewed the residents about their rotation in our facilities, which they assessed as follows:

- They valued the rotation very positively, although they felt that some rotations could be a little shorter.
- They would have liked to have more contact with doctors, even though the laboratory technicians are very well trained.
- The most highly rated rotation was with the Cell Therapy Service. It is the most organized. The physician in charge of the residents is Dr Jesús Fernandez Sojo.

4.3. Academic training

More and more BST professionals (there are now 24) carry out teaching activities in the various universities of Catalonia: Autonomous University of Barcelona, University of Girona, Rovira i Virgili University, University of Barcelona, International University of Catalonia and Ramon Llull University.

We would also like to give a special mention to all BST staff, whoever they may be, for their work in tutoring and accompanying all the students who are trained in our facilities.

4.3.1. Master's Degree in Transfusions Medicine and Advanced Cell Therapies

The Chair in Transfusion Medicine and Cell and Tissue Therapy has continued with its teaching activity through different academic and professional training programmes.

- Third edition of the Master's Degree in Transfusion Medicine and Advanced Cell Therapies

During 2020, the third year of the master's degree came to a successful close and a new one has already been started with 30 students from different backgrounds enrolled.

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2021 Geographical origin 2nd edition students

Argentina 1	Chile 1	Panama 1	Costa Rica 4
Paraguay 1	Colombia 4	Mexico 3	Spain 14
Peru 1	Dominican Republic 1	Egypt 1	

4.3.2. European School of Transfusion Medicine's (ESTM)

Although it is a consolidate programme, in our unending search for excellence, progress is being made in turning it into an international inter-university master's degree, having already signed an agreement with the University of Leiden to accredit it in both countries. All administrative processes are expected to be completed during 2021.

· Collaboration with the European School of Transfusion Medicine (ESTM).

Unfortunately, due to the pandemic, the European School of Transfusion Medicine's (ESTM) annual course could not be held.

4.3.3. Postgraduate diploma in Breast-feeding and Human Milk Donation.

· Postgrau en Lactància i Donació de Llet Humana.

The postgraduate diploma in Breastfeeding and Human Milk Donation, offered for the second time and coordinated by doctors Carlos González and Luis Ruiz, Vanessa Pleguezuelos and Marina Vilarmau, with the collaboration of the Autonomous University of Barcelona and the University of Manresa, came to a successful close.

Thirty-three students enrolled, most of them doctors and nurses from Spain and all over Latin America.

Again, its positive reception and results have been remarkable, which ensures it will be offered again.

4.4. Lifelong learning

During 2020, the Immunohaematology Laboratory, directed by Dr Eduard Muñiz, welcomed five professionals on research stays from different institutions: Grifols Internacional, IDCBIS in Colombia, Établisement Française du Sang and Hospital Marcas de Valdecillas in Santander.

These are highly specialised training courses to learn about the most innovative techniques in the field of molecular biology, platelets and the red series of this benchmark laboratory.

The new haematologists recruited by BST territorial centres also rotate through the main centre's different departments and laboratories in order to be trained in procedures and techniques and to provide the necessary training for the effective fulfilment of their new tasks. In 2020, two professionals started this training.

In 2020, the first postdoctoral training programme for foreign professionals was approved. It was scheduled to last 12 months, although it could not be completed due to the pandemic.

Coordinators

In charge of the on-line part

Carlos Gonzalez
Pediatric Specialist

He is the founder and president of ACPAM (Catalan Association for Breastfeeding) since 1991. From this association, he has directed and imparted teaching in more than 100 courses on breastfeeding for health professionals.

Author of the books: My child does not eat, Kiss me a lot, A gift for life or growing together.

Marina Vilarmau
Pedagogue, specialist in Training Projects in the Area of Health Sciences.

Master's degree in clinical simulation methodology (UVic-UCC). Master's degree in sexual difference studies (UB). With more than 10 years dedicated to the design and direction of training projects in the area of health and education sciences.

Luis Ruiz
Pediatric Specialist

Pediatrician. Trained in maternal and child health (MSc) University of London and Diploma in Senology at the University of Barcelona. Pediatrician in Primary Care at the CAP 17 de Setembre in El Prat de Llobregat and private consultation in Breastfeeding at the Quirón-Dexeus i Gavà Family Health Clinic. Former national coordinator of the IHAN and Emergency Pediatrician at the Children's Hospital of Barcelona.

Vanessa Pleguezuelos
Biologist specializing in Biosanitary

Head of the Human Milk Bank, Blood and Tissue Bank. Master's degree in scientific, medical and environmental communication. Master's degree in TAC training, Learning management and Innovation in Organizations. Certificate of Pedagogical Skills. Professor of breastfeeding courses at the Public Health Agency, the College of Nursing and the University of Barcelona.

4.4.1 Training visits

Due to the pandemic, there have only been 9 visits during the first 2 months of the year with a total of 156 students.

We were visited by: Escola del Clot, Institut Alexandre Satorras, Institut Severo Ochoa, Escola Gimbernat, Fundació Sopena Barcelona and the University of Peru.

The vast majority of attendees are studying intermediate- or advanced-level vocational training cycles in laboratory operations, laboratory analysis and quality control, manufacturing of pharmaceutical and biotechnological products and health documentation, and to be clinical and biomedical laboratory technicians. However, there were also nursing students and health professionals.

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5. The BST Research and Education team

Apart from the people directly involved, a very large number of professionals from the different departments of the BST collaborate in the smooth running of their research and education work. It is only fair that their contribution be acknowledged.

Specific mention should be made of the people in the Research and Education team:

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BST Project Manager
Elisabet Tahull

Head of Clinical Development
Ruth Coll

BST administrative assistant
Míriam Requena

Educational programme technician at the Health and Ageing Foundation
Marina Vilarmau

Coordinator of UAB educational projects
Remei Camps

Director of the Health and Ageing Foundation
Antoni Salvà

Administrative assistant at the Health and Ageing Foundation
Helena Garrigos

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Some of the projects carried out at the BST during 2020 were funded by the Ministry of Science, Innovation and Universities and co-financed by the European Regional Development Fund (ERDF).

2020
RESEARCH AND TEACHING REPORT BST

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