

2022

**DEEP TECH
TO TRANSFORM
THE WORLD**





DEEP TECH TO TRANSFORM THE WORLD

Published by the Spanish Bioindustry Association (AseBio)

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1st edition: June 2023

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Legal deposit: M-18244-2023

WITH SPECIAL COLLABORATION FROM:



THANKS TO COLLABORATORS:



Ana Polanco, Chairwoman of AseBio

BIOTECHNOLOGY, AN ESSENTIAL DEEP TECH FOR THE CHALLENGES TO COME

On 5 March 2023, the World Health Organisation announced that Covid-19 no longer constituted a public health emergency of international concern. This way, the UN health body brought an end to the pandemic after 1,191 days that had significantly changed the world as we knew it. Over these past three plus years, biotechnology has played a key role not only in finding solutions to the virus, where it has stood out as a highly innovative sector, but also in rebuilding the country and developing a model for sustainable, resilient growth, consolidating its place as a strategic sector. The social, economic and healthcare crisis has exposed our vulnerabilities, but it has also made us truly aware of our strengths, such as our ability to work as a team and achieve shared goals, to tackle important challenges that threaten our health and that of our planet.

Taking this as the jumping off point, the snapshot in this Report shows us that biotechnology,

thanks to its incredible ability to adapt and break new ground by anticipating the need for solutions to future challenges, has made it a deep tech that is transforming the world. And it's doing so through disruptive solutions tied to advanced engineering and science, such as advanced therapies, messenger RNA, the microbiome, precision nutrition, waste valorisation, CRISPR and advanced diagnostics. The mission is clear: to tackle global challenges with tools based on science and technology that open the doors to solutions that were previously unimaginable.

2030 is fast approaching and we still have a long way to go towards achieving the Sustainable Development Goals (SDG). In this global mission, biotechnology impacts 13 of the 17 SDG and has shown its great ability to respond to challenges, which is being further boosted by new digital technologies. Artificial intelligence and big data are the most well-known, applicable and interesting new technologies for companies in the sector. We're talking about science-based companies that invest heavily and take great risks to find high-impact solutions to improve our quality of life and make our environment more sustainable. Solutions that are allowing us to move ever closer to achieving the

essential Sustainable Development Goals set by the United Nations.

The pandemic made us reflect as a society and we have learned a lot from it, which will guide us towards sustainable progress based on innovation. One of the wide-reaching takeaways is that we have to facilitate the development of strategic sectors, like biotechnology, so they can provide the solutions we need for future emergencies we can't yet anticipate.

Now we are facing the opportunity to bring national, European and global agendas to fruition, and achieve the ambitious goals set at the most critical points of the healthcare emergency. We have to join forces to lay a solid foundation that will allow us to build a new model for sustainable, resilient growth in which the twin green and digital transitions are key. And biotechnology must undoubtedly be one of its cornerstones, given its proven scientific potential and driving economic force, which this Report shows are being firmly cemented. Because biotechnology companies generated over €11 billion in revenue for our country in 2021. This accounts for 1% of the Spanish GDP, and their turnover of more than €13 billion is 1.1% of the GDP. In terms of employment, we're looking at a sector responsible for 118,000 jobs, or 0.65% of total employment countrywide.

Beyond the pandemic and climate change, the two big emergencies that have occupied our society in recent years, we are also facing pressing challenges for which biotechnology has proven to have solutions. Antimicrobial resistance has already been called one of the biggest threats to global public health, potentially causing more than 10 million deaths by 2050. The ageing population is growing in some regions, while demogra-

phic growth is booming in others. A gap that is increasing and poses important challenges arising from the climate emergency and requires decisive action.

In the pages of this Report, through the voices of our members alongside the data, you can see how biotechnology is a crucial part of the search for effective disruptive solutions, thanks to its incredible ability to innovate and transversal nature. And this will only be possible if we commit to both investment and talent. Investment in innovation is a constant at biotechnology companies, as this sector has the most researchers and also the most diverse talent pool, with 60% female employees.

Plus, biotechnology continues to interest young students, with more than 8,900 students enrolled in university studies in this field last year, 62% of which were women.

Spanish society increasingly values Spanish science and technology. The biotechnology sector in our country is excellent, ranked ninth in the world, and its innovations have global repercussions. This latest edition of the Report reflects the great contributions of a sector that has grown and consolidated its place in

our country over the past two decades, working to move towards a sustainable future and truly cutting-edge health. We can't let the lessons learned and experiences we've had over the past three years be forgotten. We have to keep working to put biotechnology front and centre on the public agenda. This is the only way the sector will be able to continue contributing solutions to our needs as a society and those of the world around us.



Ion Arocena, AseBio CEO

ASEBIO WORKS TO DRIVE SUSTAINABLE, RESILIENT ECONOMIC GROWTH

2022 was a year in which the Covid-19 health-care crisis gave way to the food and energy crisis resulting from climate change and exacerbated by the war in Ukraine. In this context, AseBio kicked off a new strategic planning process to transform our growth model through the biotechnology industry. To do so, this year we have remained committed to biotechnology as a key element for achieving cutting-edge health and transitioning towards a more sustainable, resilient economic model.

There is no question that biotechnology is key in building truly cutting-edge health. To raise awareness of our members' capacities, we've highlighted their industrial capacities to promote advanced therapies, drafted an initial

narrative on antibiotic resistance, organised an event on genomics as a key tool for treating and diagnosing cancer, and followed new European regulations on advanced diagnostics.

On the other hand, we've worked to apply biotechnology solutions to the climate crisis, kicking off our participation in the European project ShapingBio, which aims to address European climate priorities with biology-based products. Finally, our coordination of the Spanish node of the European Climate Pact has drawn to a close, which we used to invite people, communities and organisations to fight climate change, promote the ecological transition and build a greener Europe.

With events like AseBio Investor Day, we've facilitated access to funding for biotech companies and accelerated their internationalisation by connecting them with 55 international investors and bodies in 30 countries, and we even helped fund the innovative projects of 5 members by becoming an Innovative Business Association (AEI).

Aware that access to funding is one of the

main worries of our members, and to monitor the funds secured by biotechnology companies through the Recovery, Transformation and Resilience Plan, we launched the Observatory of the impact of R&D programmes on the biotech sector, through which we identify the grants to fund biotechnology research and analyse the results of calls and execution of the projects, in order to propose areas for improvement.

2022 was a year full of legislative initiatives, where we defended the sector's position and took part in regulatory processes like reforming the Law on Science and the Start-Up Law.

In order to reinforce the sector's positioning as an inclusive, attractive sector of opportunities, we've shown that we are an industry with excellent talent in a study of salaries in the biotechnology sector and another on measures to attract international talent. We've also reaffirmed the fact that it is a diverse industry, celebrating International Day of Women and Girls with a panel of female scientists and entrepreneurs from the sector.

At AseBio we are aware that new digital tech-

nologies are key to biotechnology, which is why we've worked with a think tank to analyse how new technologies are being used in the biotechnology sector and to accelerate drug discovery.

In recognition of all the above, in 2022 we consolidated our community with a record 298 members and continue to become closer to society, more connected with our environment and more influential every year.

At AseBio we will continue working to transform the country's growth model through the biotechnology industry to drive an innovative economy that improves people's lives and the planet's sustainability.

Fancy joining in the transformation?



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INTRODUCTION

2022 AseBio Report

INTRODUCTION

The AseBio Report, considered the benchmark publication in the biotechnology sector since 2000, is published annually by the Spanish Bioindustry Association. Its mission is to analyse every area that makes up the situation in which biotechnology is being developed in our country today, and how it is evolving.

This edition is marked by a context in which biotechnology is providing deep innovations that are transforming the world. Biotechnology is one of the deep tech with the greatest potential as it is science-intensive and has a direct impact on people's lives and making the planet more sustainable. So, the 2022 AseBio Report, in addition to sector data and trends, includes first-hand accounts from AseBio members of the solutions they are working on to transform the world.

As it does every year, this Report provides a general overview of the status of the biotech sector, with several analyses of R&D investment, the most important financial operations, the sector's economic impact, the talent working in the sector, and the biotechnology ecosystem in Spain, as well as studies on how science and biotechnology are perceived, and scientific and technological production measured in publications, patents, and products and services launched to market. For the first time, this edition has a section on how new digital technologies are being incorporated into the biotechnology industry.

CONTENTS

The 2022 AseBio Report has 12 sections. Each of its chapters takes a closer look at the most important issues affecting the Spanish biotechnology sector:

1. Introduction and executive summary: introduce the Report, its scope and main goals, plus a brief summary of its overall content.

2. R&D investment (chapter 1): covers R&D investment in the sector, how it has evolved and a comparison to other sectors.

3. Funding (chapter 2): describes the main financial operations, venture capital activity in 2022 and how it has evolved, and the public administration's support for the sector.

4. Talent and diversity (chapter 3): shows the number of students enrolled in biotechnology, researchers in the sector and female participation in the sector.

5. Business fabric (chapter 4): analyses the number of companies that make up the sector and how it has evolved. It also provides information on what these companies are like, where they are located and the sector's ecosystem.

6. Environmental conditions (chapter 5): assesses how society perceives innovation and how the biotechnology sector perceives its environment.

7. Results of the biotech sector (chapter 6): includes scientific publications, what the

sector has patented, the main advances in biotechnology developments and products and services launched to market.

8. Collaboration and Internationalisation (chapter 7): we include the partnerships established in the sector in 2022 and international markets companies have moved into.

9. New technologies (chapter 8): an analysis of the relationship between biotechnology and new technologies, showing which have the greatest potential in the sector, how they are being applied and the hurdles blocking their implementation and use.

10. Impact (chapter 9): analyses the biotechnology sector's impact on the economy, employment and taxes collected.

11. Who's who: features information on members of the AseBio Board of Directors, Work Committees and members.

12. Methodology: explains the methodology used to compile the 2022 AseBio Report.

ACKNOWLEDGEMENTS

AseBio would like to thank all our collaborators for their support. Without their help, this report would not have been possible. And, especially:

- MERCK, our main collaborator, and Amgen, Bayer Hispania, BTI, ICEX, IQS, Quibim, Mikrobiomik, Madrid Science Park and Promega Biotech.
- All our members who have contributed the information needed to draft the contents.
- The National Statistics Institute (INE) and the Economic Forecasting Centre (CEPREDE) for their help in compiling the statistics on the sector.
- The Department of Studies and Indicators at the Spanish Foundation for Science and Technology (FECYT) for the information contributed for the section on scientific production.
- The Madrid Science Park and ClarkeModet for their analysis of patents applied for and granted in 2022.
- All the organisations that helped identify companies established in 2022.
- The State Research Agency (AEI), the Centre for the Development of Industrial Technology (CDTI) and the National Innovation Company (ENISA) for their collaboration on the chapter on finances.

EXECUTIVE SUMMARY

2022 AseBio Report

CHAPTER 1 - R&D INVESTMENT

The biotechnology sector invested €1.04 billion in 2021

In 2021, the biotechnology sector invested nearly €1.04 billion in R&D, 62% from biotech companies.

Of this investment, 64% comes from the companies' own funds and nearly half goes to pay researchers and technicians.

R&D investment levels recovered at biotech firms, up 16% after the pandemic and healthcare crisis. Nevertheless, the sector dropped to fifth in R&D investment, after R&D services, education, pharmaceuticals and motor vehicles.

CHAPTER 2 - FUNDING

The biotech sector raised €142 million

In 2022, the investment secured by Spanish biotechnology stabilised at €142 million in 46 operations, which is down from the total raised in 2021. Nevertheless, international investors continue to show interest in the Spanish sector, taking part in many of the biggest operations.

Crowdfunding grows as a path to funding in the sector, and capital stakes from international business development entities is a complementary path.

Funding through public instruments run by the Centre for the Development of Industrial Technology (CDTI) decreased and funding from the State Research Agency (AEI) increased substantially

CHAPTER 3 - TALENT AND DIVERSITY

Biotech companies have the most researchers and 60% of all employees are women

The sector continues to interest young students, with more than 8,900 students enrolled in university studies in biotechnology last year, 62% of which were women. Plus, it remains among the degrees that require the highest marks on university entrance exams.

Biotech companies have the highest percentage of researchers to total employees in the sector, surpassed only by R&D services companies, with researchers making up 14.62% of all employees.

On the ranking of women working in R&D as a percentage of total R&D staff, biotech companies remained third, with 58%, and on the ranking of female R&D workers as a percentage of all employees they remained second with 7.52%. Women still only make up 28.4% of executive teams at biotech firms, although this is above the average for IBEX-35 companies.

CHAPTER 4 - BUSINESS FABRIC

4,362 companies carried out biotechnology activities in 2021, of which 898 are biotech firms

In 2021, the number of companies in the sector grew 11.5%, of which 898 are strictly biotechnology firms. Of these, 54% are micro-SMEs and 42%, SMEs.

Among companies working exclusively in biotechnology, 50% focus on human health, 39% on food applications, 15.4% on agriculture and forestry production, 13.5% on animal health and aquaculture, 11.2% on the environment and 11.1% on industry.

In terms of regional distribution, Catalonia leads in number of biotech companies and turnover. Behind Catalonia in number of companies are Madrid and Andalusia.

CHAPTER 5 - ENVIRONMENTAL CONDITIONS

Spanish society increasingly values and is interested in Spanish science and technology, and its perception of innovation compared to other European countries remains the same

According to the FECYT Social Perception of Science and Technology in Spain survey, nearly 65% of those surveyed said science and technology have more benefits than drawbacks, compared to 50% in 2004.

Up slightly from pre-pandemic results, 76.2% of those surveyed believe innovation is a positive thing. Likewise, the perception of our country's level of innovation compared to countries around us held steady. While 45% of those surveyed in 2021 put innovation from Spain among the least advanced countries in the EU, in 2022 this percentage dropped slightly to 44%.

AseBio members perceive public opinion of biotechnology as very positive to their work. Plus, the sector's cooperation with public bodies has increased but the economic situation is still seen as a barrier.

CHAPTER 6 - RESULTS OF THE BIOTECH SECTOR

The science produced by the Spanish biotechnology sector is excellent and its innovation is patented internationally

Regarding production of scientific knowledge, Spanish biotechnology makes up 2.6% of global production and is cited 20% more than the global average. Spain returned to ninth on the global ranking by number of papers in biotechnology and produces science of excellence, with 22.8% of papers among the top 10% most cited in the world.

The biotech sector is protecting its innovations more and more internationally, mainly through PCT patents (36%) and the European Patent Office (35%).

Companies launched 109 products and services to market and signed important licensing deals.

CHAPTER 7 - COLLABORATION AND INTERNATIONALISATION

The number of partnerships is up nearly 50% in the past five years

Biotech firms forged 295 partnerships and 66% of them were with organisations from the public sector. Plus, 31% of these deals were with international organisations and 60% were for research and development.

AseBio members boosted their international presence 20% in 2022, with 43 member companies present in 56 countries on all continents. European countries are the main choice for biotechnology companies when establishing subsidiaries and the United States is the country with the most subsidiaries.

CHAPTER 8 - NEW TECHNOLOGIES

The impact of new digital technologies on biotechnology is growing

Artificial intelligence and big data are the most well-known, applicable and interesting new technologies for companies in the sector, while biorobotics is ranked last.

The main barrier for blockchain, biorobotics and the Internet of Things is lack of awareness, while for big data the issue is lack of training and for artificial intelligence, the lack of maturity or development.

Drug discovery companies have increased their use of new technologies, especially big data and artificial intelligence, mainly to find new therapeutic molecules and biomarkers.

CHAPTER 9 - IMPACT

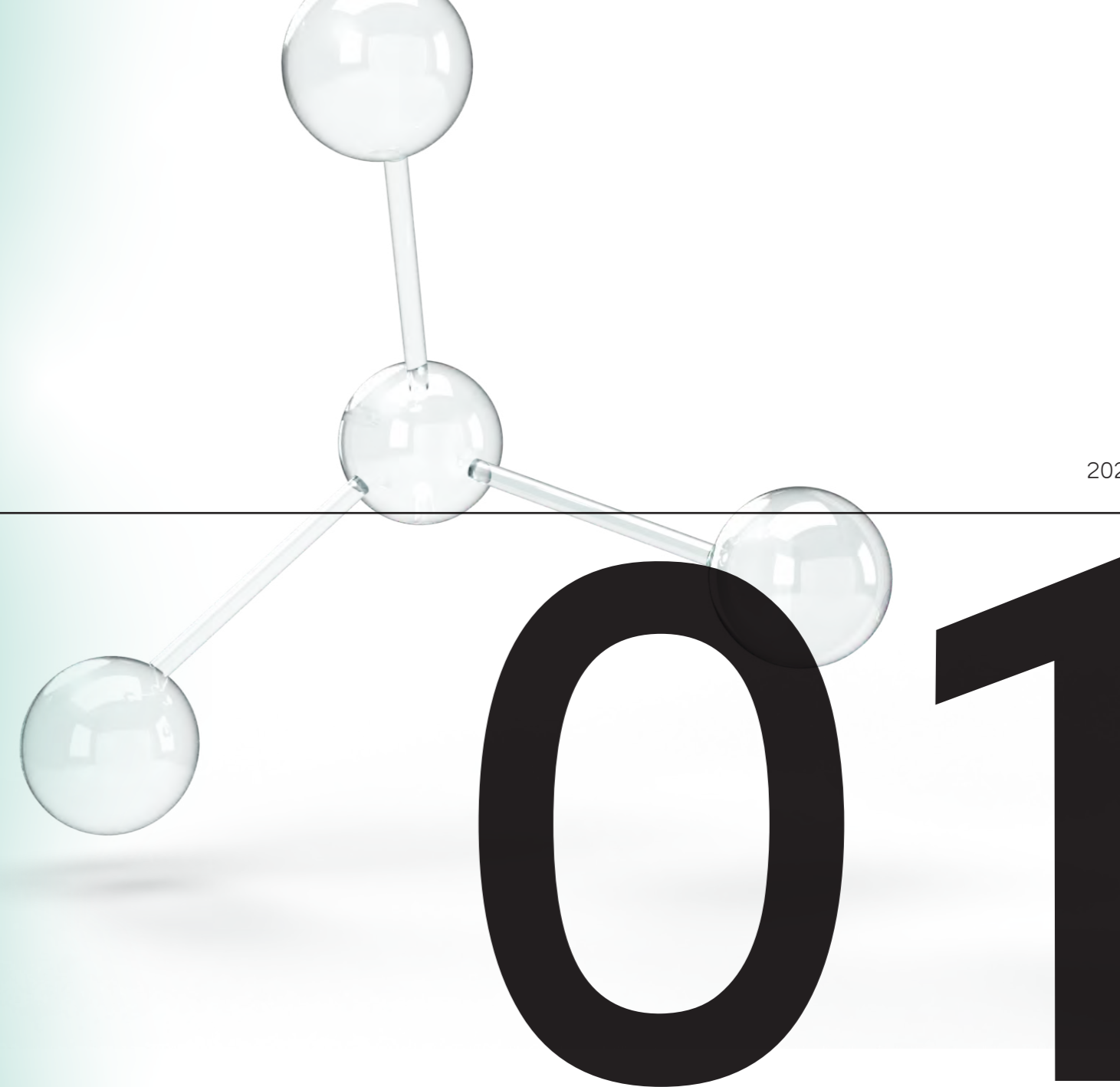
Biotech firms contribute 1% of the GDP and 118,000 jobs

The joint activity of biotech companies generated over €11 billion in income, which is 1% of the Spanish GDP, and they saw nearly €13 billion in turnover, or 1.1% of the GDP. Plus, they contribute roughly €4.5 billion in taxes, 0.4% of the GDP, and 118,000 jobs, which is 0.65% of national employment.

The sector is one of the few to see an increase in production growth, with biotech firms up 7.8%.

R&D INVESTMENT

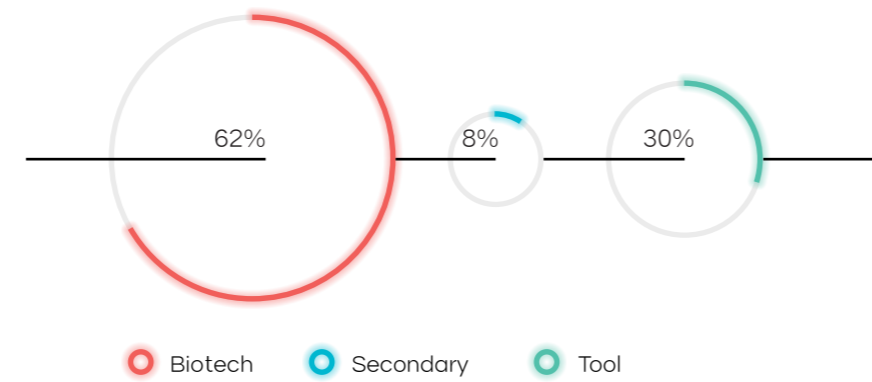
2022 AseBio Report



BIOTECHNOLOGY COMPANIES INVESTED €1.04 BILLION IN R&D IN 2021, MORE THAN 6% OF THE NATIONAL TOTAL

The biotechnology business sector, meaning companies with biotechnology as their main (biotech firms) or secondary activity, or that use it as a production tool, invested more than €1.04 billion in R&D in 2021 (graph 1.1), which is just over 6% of all Spanish investment in R&D. Biotech firms are clearly at the core of this investment, making up over 60% of the total.

R&D INVESTMENT IN BIOTECHNOLOGY IN 2021 (€ MILLION)



64% OF R&D INVESTMENT COMES FROM THE COMPANIES' OWN FUNDS AND ONLY 10% FROM PUBLIC FUNDS

R&D investment in the biotechnology business sector goes mainly to operating expenses, which is 91% of all spending. Of these operating expenses, 31% goes to paying researchers and 19% to paying technicians and assistants. The remaining 41%, goes to other operating expenses.

Capital expenses make up roughly 9% of the total and 7% goes to acquiring equipment and instruments (table 1.1).

For biotech firms, the figures vary slightly. 32% goes to paying researchers, 16% to technicians and assistants, and 40% to operating expenses. In terms of the source of the funds, R&D investment in biotech firms mainly comes from their own funds, which continue to be their main source of resources, making up nearly 64% of the total. This is followed by funds from the business sector (13%), funds from other countries (11%), funds from the Public Administration (10%) and funds from non-profit organisations (1%).

GRAPH 1.1.
Breakdown of R&D investment in biotechnology by companies.
Source: INE. Survey on Biotechnology Use. 2021.

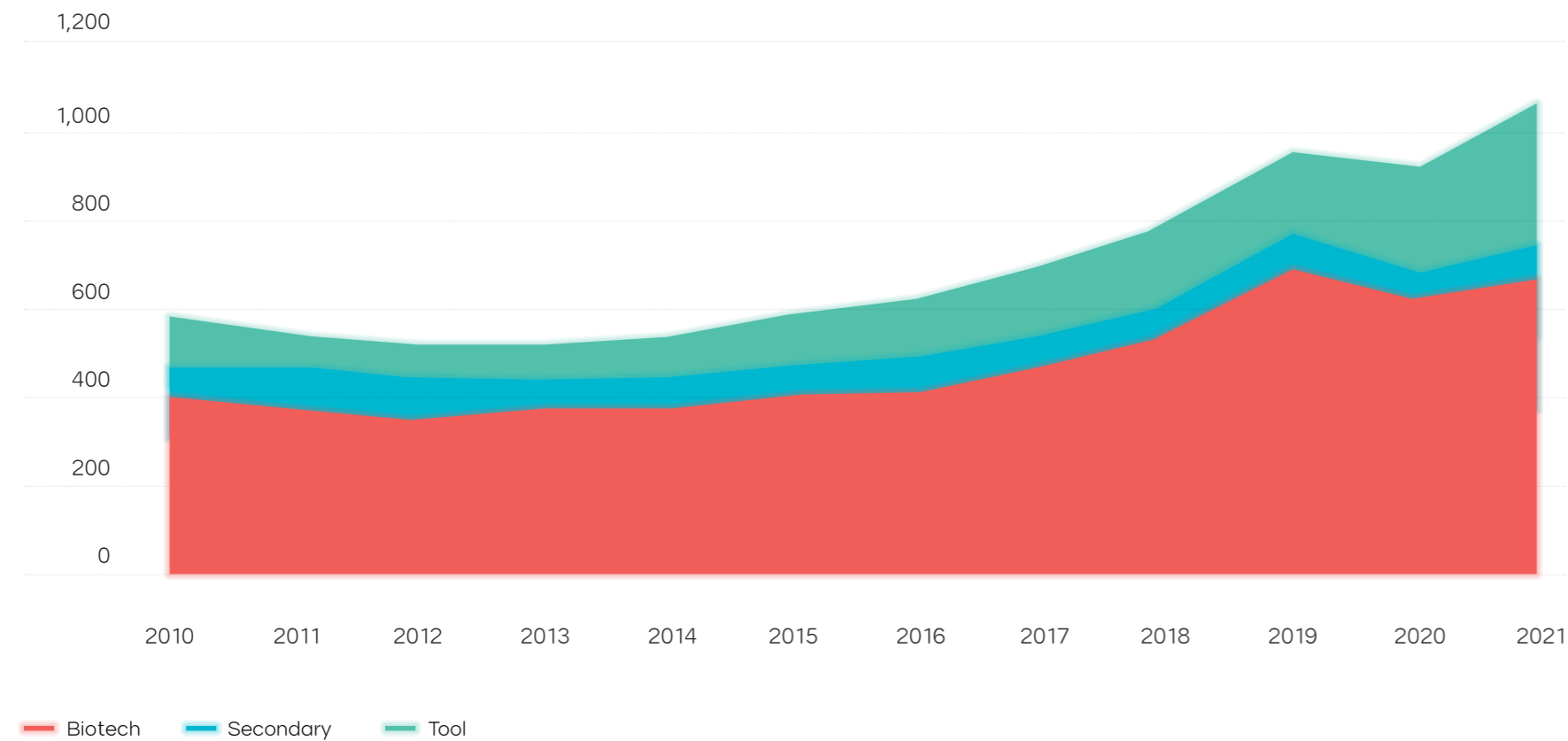
	Biotech	Secondary	Tool	BIOTECHNOLOGY TOTAL
Internal R&D expenditure in biotechnology	643.05	81.05	313.78	1,037.89
A) By nature of the expenditure				
Operating expenses	569.18	76.17	294.12	939.47
-Paying researchers	206.51	32.64	82.38	321.53
-Paying technicians and assistants	105.02	12.98	76.66	194.66
-Other operating expense	257.66	30.55	135.08	423.29
Capital expenditures	73.87	4.88	19.66	98.42
-Land and buildings	7.45	0.60	2.10	10.15
-Equipment and instruments	53.21	3.50	15.83	72.54
-Acquisition of specific R&D software	4.29	0.37	1.05	5.71
-Other intellectual property products specifically for R&D	8.92	0.41	0.68	10.01
B) By source of funds				
-Internal funds	412.95	55.58	242.51	711.04
-Funds from the business sector	82.59	8.58	30.43	121.60
-Funds from the public administration sector	66.48	11.40	29.54	107.42
-Funds from the higher education sector	0.07	0.01	0.11	0.19
-Funds from private non-profit organisations	9.44	0.00	1.31	10.76
-Funds from the rest of the world	71.52	5.48	9.88	86.88

TABLE 1.1.
R&D Investment in 2020 by nature of expenditure and source of funds (€ millions).
Source: INE. Survey on Biotechnology Use. 2021

IN 2021, R&D INVESTMENT SURPASSED PRE-PANDEMIC LEVELS

After the drop in 2020 as a result of the crisis caused by the Covid-19 pandemic, R&D investment picked up steam again in 2021 among biotechnology companies. This recovery meant a 16% increase, one of the highest growth rates in recent years, surpassed only by the 22% jump seen in 2019.

It is worth noting the significant increase in R&D carried out by companies that use biotechnology as a production tool, at 44%, followed by biotech companies with 7% and companies that use biotechnology as a production tool with 4%.

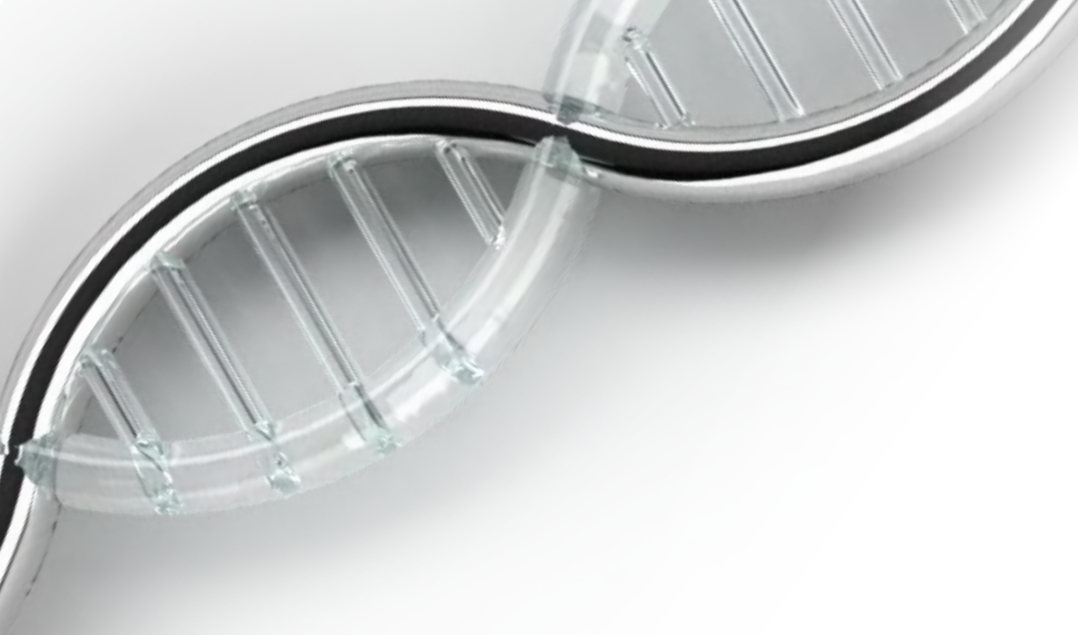


GRAPH 1.2. Evolution of R&D expenditure (€ millions) 2010-2021. Source: INE. Survey on Biotechnology Use.



If we compare the increase in R&D investment in the biotechnology sector to other sectors of the economy (graph 1.3), both biotech firms and companies with biotechnology as a secondary activity invested more, although less than the global average: 6.7% and 4.4%, respectively, compared to 8.9% growth in total investment. Regarding the companies using biotechnology as a production tool, their growth rate for R&D investment was up 44.5%.

GRAPH 1.3. Growth in R&D expenditure in 2021 (Year-on-year growth rate). Source: Compiled internally from 2021 Survey on Biotechnology Use and Statistics on R&D activities. INE.



GRAPH 1.4.
Growth in R&D expenditure in 2021 (Year-on-year growth rate).
Source: Compiled internally from 2021 Survey on Biotechnology Use and Statistics on R&D activities. INE.

BIOTECH FIRMS DROP TO FIFTH AMONG INDUSTRIAL SECTORS IN R&D INVESTMENT

Strictly biotechnology companies remain among the top ranked in R&D investment relative to production, at 4.98%. This time, in addition to R&D services, education and pharmaceutical companies, the branch related to motor vehicles also made the list (Graph 1.4).



Manuel Zafra, President of Merck Spain

BIOTECHNOLOGY: A SURE BET FOR A BETTER TODAY AND TOMORROW

At Merck our goal is to help make human progress sustainable through science, technology and the commitment to excellence of the company's 64,000 employees. We are stalwart defenders of biotechnology as a strategic sector for transforming knowledge into innovation, and innovation into a society that lives longer and better, both in terms of health and economic growth. Innovation saves lives and money, and this is one of the maxims we defend in our position of leadership at AseBio.

Our vision of how biotechnology boosts growth can be seen in specific actions, such as the network of biotechnology plants Merck has around the world, which is still growing. This year, we've inaugurated the Biotech Development Centre in Corsier-sur-Vevey (Switzerland), investing €250 million. With this facility, Merck now has nine plants for developing and manufacturing biotechnology products. Plus, eight of them are in Europe, clearly showing how highly

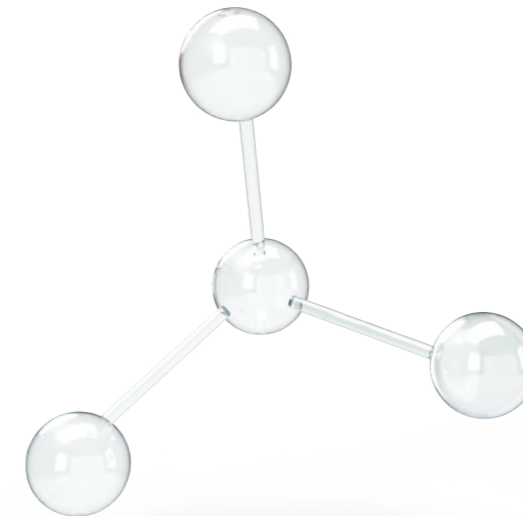
the company values this continent, despite the loss of competitiveness and attractiveness for innovation in terms of production and R&D, which we trust will be resolved with the new Pharmaceutical Strategy for Europe currently being drafted.

Of all our plants, I would like to highlight the one in Tres Cantos (Madrid), given its proximity and our pride in it. It is one of our flagships, not only of Merck Spain but for the Group globally. There we manufacture 100% of the growth hormone we sell around the world, which helps 50,000 patients, as well as 80% of the hormone we use in fertility treatments (our local production has made it possible for more than 3.5 million babies to be born). I can think of no better way to demonstrate the impact innovation has on people's lives than its contribution to making life.

In recent years, our R&D strategy has focused on areas where we can have the greatest impact, advancing our clinical development programmes to the final phase only when we have very solid proof of the real value to patients of the therapies being researched, focusing on oncology, immunology and neurology. Spain is contributing more than almost any other Euro-

pean country to turning knowledge into results. Part of the €2.52 billion Merck spent on R&D in 2022 went to conducting 47 clinical trials locally and Spain stands out as one of the top patient recruiters for global research programmes, for example in bladder cancer.

All of this commitment to innovation is nothing if it doesn't reach those who need it most as quickly and fairly as possible, without exception. At Merck we will continue working with the authorities in our country to overcome current barriers to accessing innovation to benefit all of society.



MERCK





TECHNOLOGICAL SOLUTIONS AS ESSENTIAL ALLIES FOR SCIENCE IN ADDRESSING SOCIETY'S CHALLENGES

Thirteen generations have passed since Merck was established as a small chemist's in Darmstadt, Germany in 1668. Today the company has become a leader in science and technology with a team of over 64,000 people in 66 countries. A history that spans three centuries and explains our ongoing commitment to curiosity and innovation. Innovation that has helped us drive sustainable human progress with one clear goal: to improve people's lives and the planet, reflecting our commitment to society and future generations.

Aware that we can only advance through a firm commitment to science, Merck's three business divisions (Healthcare, Life Science and Electronics) are generating solutions to address the big challenges we are facing as a global society, such as access to healthcare and encouraging responsible consumption and production, challenges expressed in the United Nations Sustainable Development Goals (SDG).

To advance towards achieving the health goals related to SDG 3, Merck has put its R&D to work for society, seeking to cover unmet medical needs in neglected communities caused by malaria and schistosomiasis, both highly prevalent in Sub-Saharan Africa. The company's commitment to improving access to healthcare can also be seen in our fifth-place ranking on the 2022 Access to Medicine Index. This index looks at the 20 largest pharmaceutical companies in the world and ranks them based on governance and access to medicines in low- and middle-income countries.

According to the World Health Organisation, there were 241 million cases of malaria in the world in 2020 and 627,000 deaths caused by this disease, most in children under 5 years old.

To stop the spread of malaria, Merck is working with scientists from the Institute of Experimental and Technological Biology (IBET) and the Institute of Molecular Medicine (IMM) in Lisbon to

research and develop a novel platform using 3D cells to discover new malaria drugs that target the liver-stage parasites that cause the disease, and to identify and study new compounds that could help prevent the disease and put a stop to this illness around the world.

In its contribution to SDG 12, Merck is working to alleviate the consequences of resource scarcity and driving innovation in the cultured meat industry as a healthy, ethical, eco-friendly alternative.

The United Nations Food and Agriculture Organisation (FAO) calculates that the world population will increase by 2 billion over the next 30 years, with meat consumption increasing up to 70% by 2050. Currently, meat production accounts for nearly 14.5% of all greenhouse gases produced by human activity.

Cultured meat is a food created from animal stem cells that attempts to recreate the sen-

sation and experience of eating animal meat. The cultured-meat industry has many benefits for society, including lower greenhouse-gas emissions and less water, arable land and power used.

As a leading provider in the biopharmaceutical industry, Merck has the knowledge in science and biotechnology, as well as the development capabilities needed to produce this type of meat using open innovation models with companies from various fields, start-ups, researchers and more.

Additionally, as part of our goal to contribute to responsible production, the company has also launched a ground-breaking programme to recycle single-use biopharmaceutical technologies that recycles plastic waste and turns it into non-hazardous reusable plastic wood. There are 16 companies in the sector involved in this programme and it has recycled 7,445 tonnes of plastic waste since 2015.

The future is marked by research, science and talent. In that future, Merck will continue collaborating to develop ideas that lead to paradigm shifts, bring about innovations that benefit all of humanity and allow us to continue building solutions to improve the lives of the coming generations.



FUNDING



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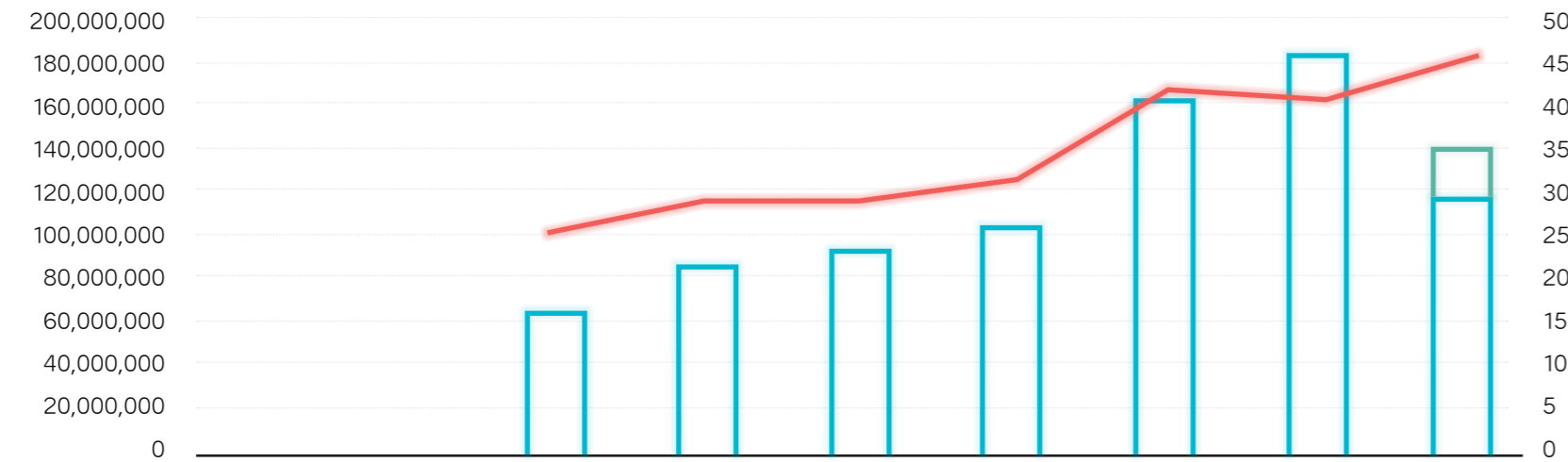
02

2.1 PRIVATE FUNDING INSTRUMENTS

THE BIOTECH SECTOR RAISED €142 MILLION IN 2022

After two years of unprecedented growth due to the pandemic, the investment secured by Spanish biotechnology stabilised in 2022 at €142 million, of which €24 million was in a capital increase by offsetting receivables.

Not counting this last operation, there was a 34% drop in the total secured compared to 2021 and the average per operation was €2.6 million. Including this operation, the investment was down 21% and the average per operation was €3.1 million. The number of operations, however, rose to 46. While there were 4 operations over €10 million in 2020 and 5 in 2021, in 2022 there were only 3. So, although 2022 had the highest number of operations, their total volume was lower than in previous years.



GRAPH 2.1. Evolution of private capital operations (2016-2022). Source: AseBio.

	2016	2017	2018	2019	2020	2021	2022
Volume offsetting credits (€M)							
Total volume (€M)	63.5	93.8	94.5	103.3	160.1	181.0	118.7
Number of operations	26	29	29	32	42	41	46

Minoryx, a company searching for a treatment for the rare neurodegenerative disease X-linked adrenoleukodystrophy (X-ALD), saw the biggest operation of 2022 with €51 million raised from national and international investors. This operation was led by Columbus Venture Partners and Caixa Capital Risc, with other Spanish investors including CDTI through the Innvierte programme, Ysios Capital and HealthEquity. The international investors were Fund+, S.R.I.W, SFPI-FPIM and Sambrinvest (Belgium), Roche Venture Fund (Switzerland and US), Kurma Ventures (France and Germany) and Chiesi Ventures (Italy).

ADL Biopharma secured €24 million in its capital increase by offsetting the receivables with

its sole investor: Kartesia. DeepUll, created by Jordi Carrera and Rafael Bru after selling Stat Diagnostica which is developing a system for early diagnosis of sepsis, raised €13 million in a capital increase. This operation, in addition to Spanish investors Axis and Alta Life Sciences, also included international investors Kurma Ventures and UI Investissement from France.

The CDTI co-investment vehicle INNVIERTE accompanies professional private investors in rounds of funding, investing jointly. It kicked off in 2019 and has co-invested in 25 companies over these past 4 years, paying out €4.4 million in 2019, €23 million in 2020, €12 million in 2021 and nearly €15 million in 2022. In terms of the amount pledged, in 2019 it was €19.2 million; in

2020, €15.8 million; in 2021, €21,5 million; and in 2022, €15.5 million, for a total of €72 million pledged over these 4 years for 29 biotechnology companies.

Organisation	Participating investors	Instrument	Total investment volume pledged (€)
Minoryx	Columbus Venture Partners / Caixa Capital Risc / CDTI Innvierte / Ysios Capital / Fund+ / Roche Venture Fund / Kurma Partners / Chiesi Ventures / S.R.I.W / Idinvest Partners / Eurazeo / SFPI-FPIM / HealthEquity / Sambrinvest	Private capital increase and loan	51,000,000
ADL Biopharma	Kartesia	Capital increase by offsetting receivables	24,000,000
DeepUll	CDTI Innvierte / Kurma Partners / Aliath Bioventures / UI Investissement / Axis Participaciones Empresariales	Capital increase	13,000,000
Tetraneuron	Current and other partners	Capital increase	5,000,000

TABLE 2.1. Private capital increases in Spanish biotechnology companies in 2022. Source: AseBio.

Organisation	Participating investors	Instrument	Total investment volume pledged (€)
Devon Labs	Inveready	Participation loan	4,500,000
IFFE Biotech	Inveready / Xesgalicia	Loan	3,250,000
Biolvegass	Caja Rural de Soria / Soria Futuro / Iberaval / Sodical	Capital increase	3,000,000
Nanoligent	i&i Biotech Fund / Avanteca Partners / Angels for Growth (IAG)	Capital increase	2,800,000
VIVEbiotech	Current partners / Inveready / CDTI Innvierte	Capital increase with share premium	2,500,000
Cocoon Bioscience	Master ALG / Columbus Venture Partners	Participation loan and shares	2,450,000
Vytrus Biotech	Zamit Capital / ICF / Perfumerías Julia	Capital increase	2,400,000
Innerva Pharmaceuticals	Inveready	Capital increase	2,300,000
Arthex Biotech	Invivo Capital Partners / AdBio Partners	Capital increase	2,000,000
Coccus	Big idea Ventures / Cargill Ventures / Clave Capital / Eatable Adventures	Capital increase	2,500,000
Medical Plasmas	Clave Capital / CDTI Innvierte	Capital increase	1,520,000
Integra Therapeutics	Columbus Venture Partners	Capital increase	1,500,000
Telomere Therapeutics	CDTI Innvierte	Capital increase	1,800,000
Feedect	Clave Capital / Dadelos / BA's / Maran Participadas	Capital increase	1,600,000

Organisation	Participating investors	Instrument	Total investment volume pledged (€)
Laminar Pharma	Private investors	Capital increase	1,341,618
LiberaBio	Family Office / XesGalicia (InnovaTech) / Nowture / Semola Tech Ventures / Business Angels	Capital increase	1,300,000
Innomy Biotech	Corporación Cervino / Rockstart / Zubi Capital / Eatable Adventures / CNTA	Capital increase	1,300,000
Viva in Vitro Diagnostics	WannaSeed / Vincle Capital	Capital increase	1,155,000
Flomics Biotech	Business Angels / Family offices	Capital increase	1,000,000
Gyala Therapeutics	Invivo Capital Partners	Capital increase	1,000,000
Abanza Tecnomed	Clave Capital / New industrial investors	Capital increase	810,000
Oncostellae	Inveready / FiTalent / Unirisco	Capital increase	800,000
Affirma Biotech	Business Angels	Capital increase	600,000
AtG Therapeutics	Blue Goose Capital / WA4STEAM / StapleCat / Inveniam	Capital increase	556,000
Medibiofarma	Inveready / FiTalent	Capital increase	500,000
ADNTRO Genetics	Family offices	Capital increase	500,000
Nucaps Nanotechnology	Capsa Vida / Clave Capital	Capital increase	500,000
Naturemimetix	Celavista Mitobiogenesis	Capital increase	490,000

Organisation	Participating investors	Instrument	Total investment volume pledged (€)
Nuage Therapeutics	CDTI Innvierte	Capital increase	450,000
Next-gen Leather	BeAble Capital	Capital increase	450,000
Insekt Label Biotech	Clave Capital / Erkop S.Coop / Viscofan	Capital increase	450,000
Histocell	Reprocell Inc. / Private investors	Capital increase	436,650
BQC Redox Technologies	Clave Capital	Capital increase	350,000
Biohope	Business Angels	Capital increase	300,000
Quality Advanced Therapies Research	Columbus Venture Partners	Participation loan	300,000
Neurofix	Current partners	Capital increase	299,904
Crazy Science & Business SL	Family offices	Capital increase	250,021
Limno Pharma	Business Angels / Grupo Covirán	Convertible participation loan	175,000
Solutex	Nexus Iberia	Capital increase	150,000
Connecta Therapeutics	Inveready	Capital increase	100,000
Exheus	Decelera Ventures / WA4STEAM / Next Gen Ventura AI / SCP / Next Gen Venture CI	Capital increase	42,548
Ficosterra	Sodical	Capital increase	Confidential

OPERATIONS INCLUDING INTERNATIONAL INVESTORS NEAR €100 MILLION

The total secured in capital increase operations that included international investors was once again nearly €100 million. A total of seven companies received support from investors in countries including Belgium, the United States, the United Kingdom, France, Germany, Italy, Japan, Luxembourg, the Netherlands and Switzerland.

The companies that received support from international investors once again included biotechnology firms focusing on food, such as Coccus, which is producing animal, plant and cell protein analogues using bioprinting.

	Columbus Venture Partners	Spain	
	Caixa Capital Risc	Spain	
	CDTI Innvierte	Spain	
	Ysios Capital	Spain	
	Fund+	Belgium	
	Roche Venture Fund	Switzerland and US	
	Kurma Partners	France and Germany	
Minororyx	Chiesi Ventures	Italy	51,000,000
	S.R.I.W	Belgium	
	Idinvest Partners	France	
	Eurazeo	France	
	SFPI-FPIM	Belgium	
	Sambrinvest	Belgium	
	HealthEquity	Spain	
ADL BioPharma	Kartesia	United Kingdom	24,000,000
	CDTI Innvierte	Spain	
	Kurma Partners	France and Germany	
DeepUll	Aliath Bioventures	Spain	13,000,000
	UI Investissement	France	
	Axis Participaciones Empresariales	Spain	

TABLE 2.2.
Private capital increase operations with international investors in 2022.
Source: AseBio.

Nanoligent	i&i Biotech Fund	Luxembourg	2,800,000
	Avanteca Partners	Switzerland	
	Angels for Growth (IAG)	Italy	
Arthex Biotech	Invivo Capital Partners	Spain	2,000,000
	AdBio Partners	France	
Coccus	Big idea Ventures	US	2,500,000
	Cargill Ventures	US	
	Clave Capital	Spain	
	Eatable Adventures	Spain	
Innomy Biotech	Rockstart	Netherlands	1,300,000
	Corporación Cervino	Spain	
	Zubi Capital	Spain	
	Eatable Adventures	Spain	
Histocell	CNTA	Spain	436,650
	Reprocell Inc	Japan	
	Private investors	Spain	

STOCK MARKET OPERATIONS

Atrys Health, which went public on the BME Growth in 2016, debuted on the Spanish Main Market in early February 2022. Plus, in June the company completed a €72 million capital increase by issuing new shares, bringing on board new national and international investors and Spanish family offices.

Plus, **Oryzon**, which has been traded on the Main Market since 2015, launched a convertible bond programme with Swiss manager Nice & Green for €20 million.

Pangaea Oncology, which focuses on precision oncology and personalised medicine based on genetic analyses, raised €12 million in two capi-

tal increases by issuing shares.

These operations, with that of the company **Biotechnology Assets**, totalled over €125 million.

	2016	2017	2018	2019	2020	2021	2022
Capital increases by publicly traded companies	€20,522,889	€41,345,199	€38,648,445	€52,144,440	€70,369,911	€701,101	€125,629,998

TABLE 2.3. Evolution of capital increases by companies traded on either the Continuous Market or the BME Growth. Source: AseBio.

MERGERS AND ACQUISITIONS AS A GROWTH STRATEGY FOR BIOTECHNOLOGY FIRMS

US firm VeriSIM Life acquired Molomics Biotech, a company that uses artificial intelligence to design new therapeutic molecules.

German healthcare company Fresenius Kabi acquired 55% of **mAbxience**, a subsidiary of **Insud Pharma**. The company paid €495 million and aims to create its own biotechnology unit.

Unlike previous years, when acquisitions and mergers brought in international biotechnology companies, this year saw acquisitions by consolidated Spanish companies with ties to biotechnology. This is a strategy for growing and consolidating the biotechnology sector.

AB Biotics acquired Alifarm, which manufactures pharmaceutical products, dietary supplements and probiotics. The total purchase price was €3.5 million.

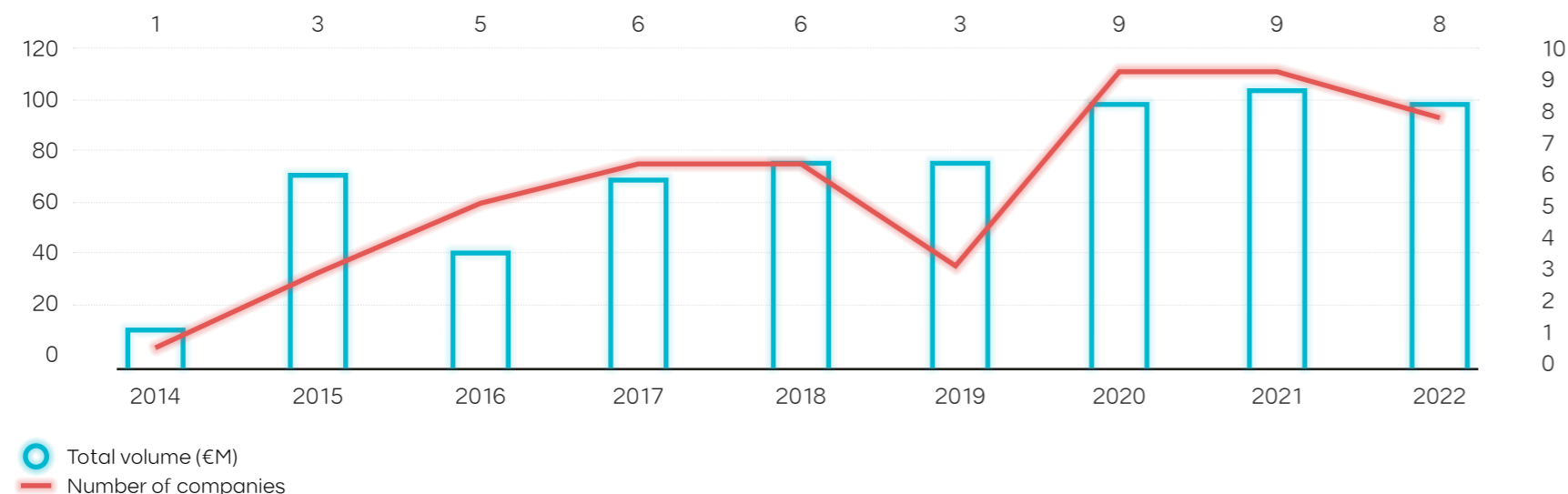
Biorizon Biotech acquired 100% of Blue Heron Plant Biodynamics, which develops bio-based products and works on plant protection and production.

Atrys Health announced it has acquired 100% of Initia Oncologia and 70% of its subsidiary Initia Research. It also acquired 100% of Telmed Spa and its Chilean company ChileRad.

The **Zendal Group** announced it has acquired 46% of the shares in the Maymó group, which specialises in veterinary products. With the operation, Zendal is strengthening its animal health division.

Insud Pharma acquired **Algenex**, an operation that also created the spin-off Cocoon Bioscience, which will specialise in developing the CrisBio® platform to produce recombinant proteins for use in food and health.

GRAPH 2.2. Evolution of volume of private capital increase operations with international investors (2014-2022).



Natac acquired INOREAL, which focuses on the saffron-extracts market. With this operation, Natac has expanded its offering of value-added bioactive ingredients.

Laboratorios Rubió announced it has purchased a company that makes products for neuropathies of the central nervous system and muscle and joint health, Fisiopharma. This way, Rubió has expanded its goals for moving into the OTC segment.

FUNDING THROUGH LOANS AND CAPITAL STAKES FROM BUSINESS DEVELOPMENT ENTITIES IS UP AGAIN

This section looks at complementary funding obtained by biotechnology companies through participation loans, venture debt or equity shares held by regional, national or international business development bodies.

In terms of the regional and national bodies, they are financial instruments like participation loans and venture capital, or loans granted by ENISA, a public company under the Ministry of Industry, Trade and Tourism. In 2022, the total number of operations held steady at 19, although the total volume secured through this type of instruments was up 21%.

As we've seen in recent years with cases like Anaconda Biomed, **Minoryx**, **Ability Pharma** and **Sanifit**, biotechnology companies keep turning to other pathways to fund their R&D, such as the European Investment Bank, which grants loans for investments that help achieve the goals of the European Union. In 2022, the EIB granted €20 million in venture debt to biotechnology company **DeepULL**.

TABLE 2.4. Evolution of loans granted by ENISA, regional societies and instruments of international bodies (2016-2022). Source: AseBio, Sodena and ENISA.

	2016	2017	2018	2019	2020	2021	2022
Total volume international organisations (€)					47,500,000	10,000,000	20,000,000
Number of international operations				4	1	1	
Total volume (€)	7,695,000	10,824,589	3,715,155	5,584,000	3,114,000	5,361,000	6,479,337
Number of operations	33	29	22	27	13	19	19
Average total per operation (€)	233,182	373,262	168,871	206,815	239,538	282,158	341,018

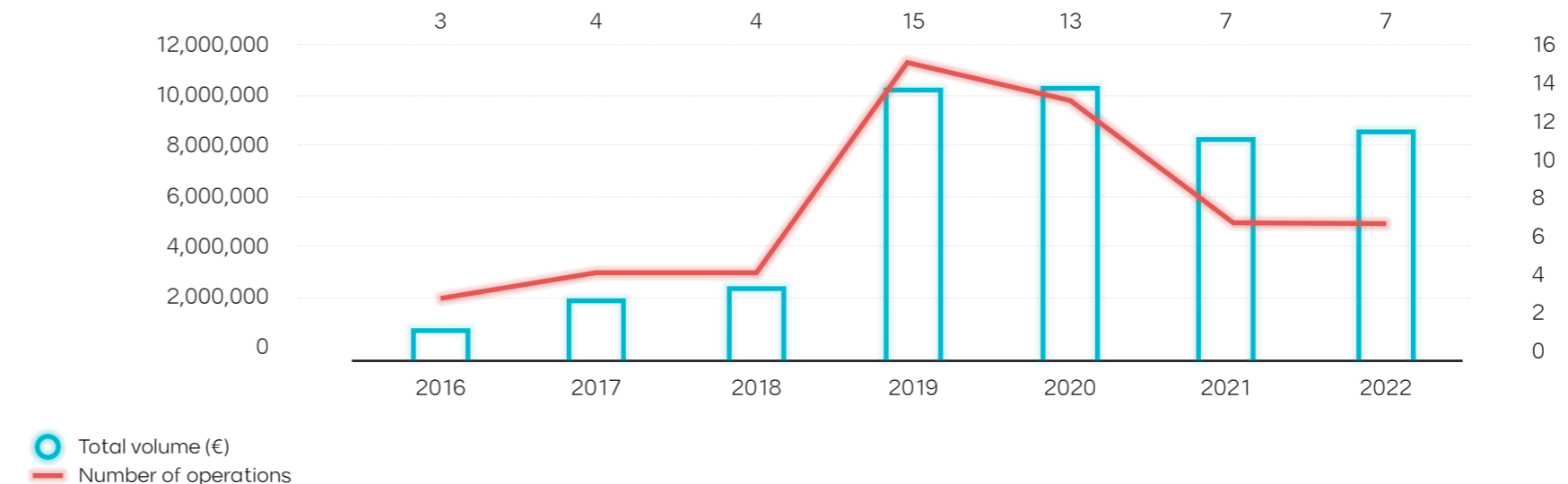
RECORD CROWDFUNDING OPERATIONS

Capital Cell is positioned as the main crowdfunding platform for biotechnology companies in Spain. The seven biotechnology companies that chose this tool raised a joint total of €8.7 million, up slightly from the previous year.

Laminar Pharma raised over €3.5 million on the Capital Cell crowdfunding platform, a record for the most secured through this type of instrument.

Organisation	Crowdfunding platform	Total investment volume pledged (€)
Laminar Pharma	Crowdfunding-Capital Cell	3,522,124
Arjuna Therapeutics	Crowdfunding-Capital Cell	1,499,708
Onalabs	Crowdfunding-Capital Cell	1,139,091
Antalgenics	Crowdfunding-Capital Cell	790,724
Exheus	Crowdfunding-Capital Cell	607,452
Made of genes	Crowdfunding-Capital Cell	603,157
Rimbarlat	Crowdfunding-Capital Cell	574,101

TABLE 2.5. Crowdfunding operations by Spanish biotechnology companies in 2022. Source: AseBio and Capital Cell.



GRAPH 2.3. Evolution of crowdfunding operations by biotechnology companies. 2016-2022. Source: AseBio and Capital Cell.

EVOLUTION OF VENTURE CAPITAL FUNDS THAT SPECIALISE IN BIOTECHNOLOGY

Asabys Partners announced in 2022 that it had increased its fund to €117 million by bringing in €30 million from the European Investment Fund. However, that same year, they also announced the launch of the new Sabadell Asabys Health Innovation Investments II (SAHII 2) fund, which hopes to raise €200 million and as of February 2023 had already secured half of this amount.

Clave Capital, the investment management firm from Navarra that works with alternative assets, launched a fund with a target size of €80 million to invest in early stage technology transfer projects in healthcare. Of the €80 million, €40 million is from the CDTI Innvierte programme.

Inveready launched its Inveready Biotech IV, S.C.R, S.A. fund with €50 million, looking to invest between €1 million and €8 million in Spanish and European start-ups. Plus, it acquired 50% of the leading value investment fund managers in Spain, True Value Investments, SGIC, S.A, which manages over €300 million. With this operation, Inveready entered the investment fund market, expanding its line of products.

Additionally, Noso Capital SGEIC, S.A. approved the setting up of a private capital fund called Bio&Tech Smart Capital, with promoting partners **Zendal** and the co-founders and CEO of Mestrelab Research and IMSPEX Diagnostics Ltd. This fund aims to drive sustainable growth in the biotechnology and new technologies ecosystem in Galicia and aspires to manage up to €50 million.

Plus, promoted by BIOHUB VLC (business centre focusing on the life sciences) and led by the company Health in Code and Ética, they created Biozell Ventures, a new co-investment vehicle in health and biotechnology.

Consultancy firms GENESIS Biomed and FI Group, along with the company Crowd4Ventures, created GENESIS Tech Transfer Boost, a new investment vehicle endowed initially with €1 million to invest in early-stage projects in the healthcare research arena.

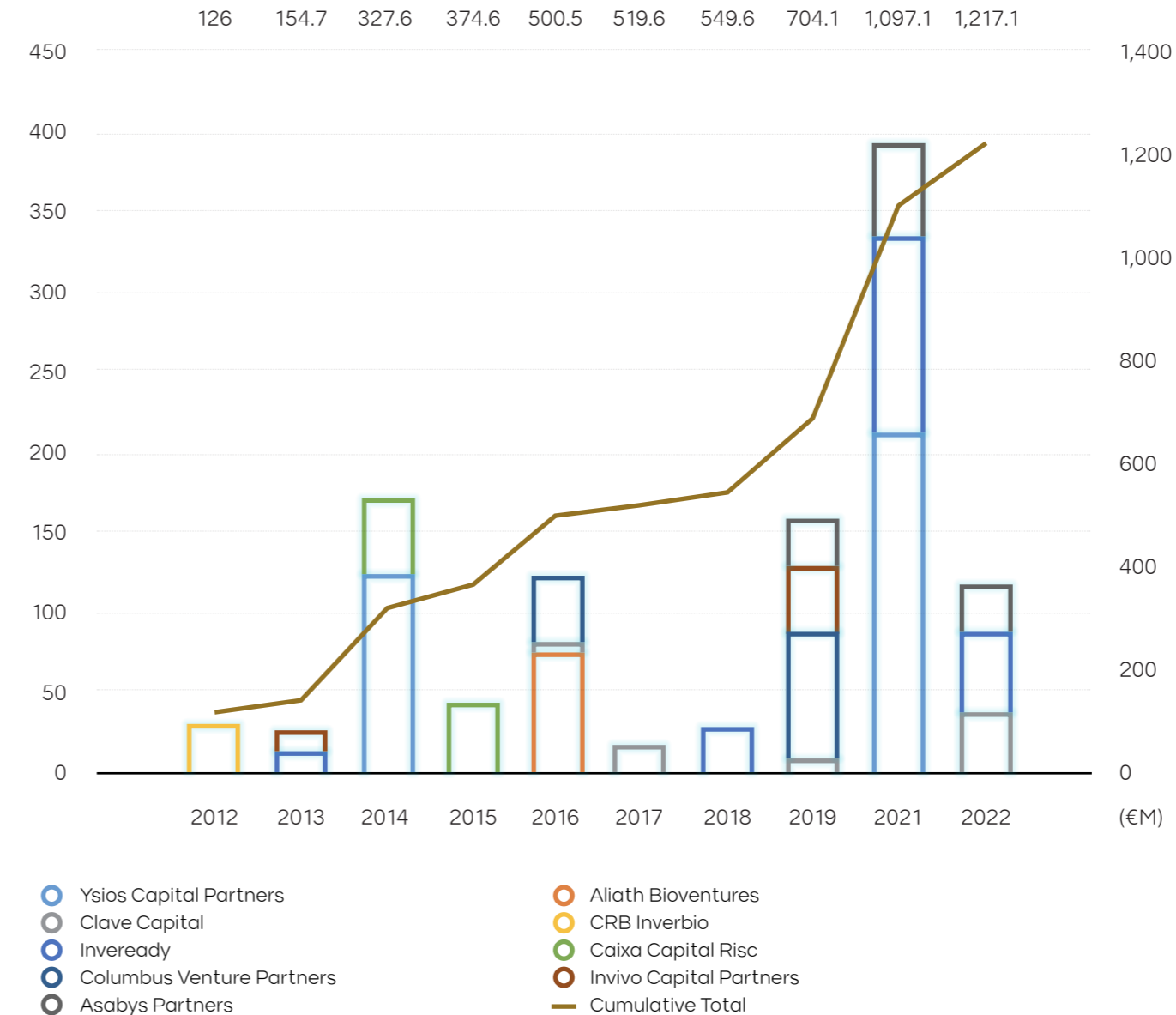
Daniel Oliver, director of the main crowdfunding platform in the biotech sector - **Capital Cell**, with businesspeople Josep Magdalena, Joan Mercadal and David Garcia, created the fund manager Nara Capital, specialising in early stage biomedical companies. They hope to partner with international funds and raise €25 million.

Additionally, although not specialising specifically in the biotechnology sector, it is interesting to mention the Andromeda fund, with €300 million, which aims to invest in European scale-ups related to sustainability, sustainable agriculture and the circular economy, among others. The fund was set up by ICO, through the Fond-ICO Next Tech; Iberdrola, through its PERSEO start-up programme; Nortia Capital and Seaya Ventures.

This year, as it is a special year with three fund managers setting up new funds, at AseBio we wanted to analyse the evolution of investment funds over the past 10 years. As graph

2.4 shows, over the 10 years between 2012 and 2022, the aggregate volume of funds targeting the biotechnology sector was over €1.2 billion.

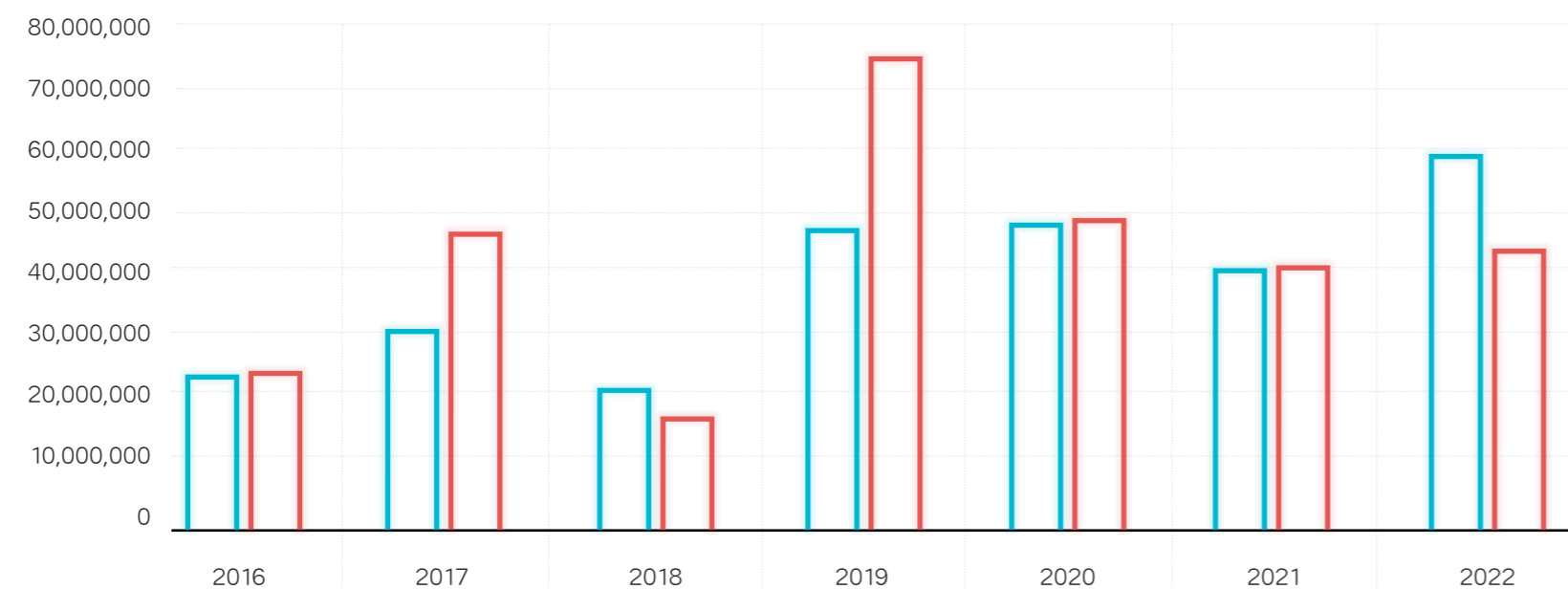
Broken down by fund manager, Ysios Capital has reached the highest total with its three funds, at over €400 million managed. Followed by Columbus Venture Partners with 3 funds totalling €236 million.



GRAPH 2.4. Evolution of venture capital funds in biotechnology, 2012–2022. Source: AseBio.

CAPITAL PLEDGED AND PAID OUT BY VENTURE CAPITAL OPERATORS INCREASES

According to the analysis of venture capital managers that invest in Spanish biotechnology companies conducted by AseBio, the total pledged and paid out in 2022 rose. These organisations, Asabys Partners, Ysios Capital, Clave Capital, Invivo Capital Partners, Inveready, Columbus Venture Partners, CRB Inverbio, Alta Life Sciences and Caixa Capital Risc, paid out over €58 million and pledged over €43.5 million. This is a 44% increase in the amount paid out and a 7% increase in the amount pledged.



GRAPH 2.5.
Evolution of volume paid out and pledged. (2016-2022).
Source: AseBio.

● Paid out
● Pledged

2.2 PUBLIC FUNDING INSTRUMENTS

In addition to private instruments, the biotechnology sector also turns to public grant programmes, including those run by the Centre for the Development of Industrial Technology (CDTI) and the State Research Agency (AEI). Below is an analysis of how CDTI grants for R&D projects have evolved in the biotechnology sector since 2012, and the evolution of those awarded by the AEI State Programme for Research, Development and Innovation since 2014.

R&D PROJECTS AND NEOTEC GRANTS SUPPORTED BY THE CDTI IN THE BIOTECHNOLOGY ARENA

The CDTI supports business projects for industrial research and experimental development to create or significantly improve a production process, product or service, submitted by one or a group of companies. In the innovation arena, it supports projects close to market that help boost the company's competitiveness by incorporating emerging technology in the sector.

Neotec subsidies are intended to fund new technology-based companies, which are those whose main activity is to exploit products or services that require the use of technology or knowledge developed through research activity.

In 2022, 20 projects in biotechnology were funded, including individual R&D projects, Eurostars projects to support Innovative SMEs, Era-Net projects for European technological cooperation and SME Seals of Excellence grants.

Plus, seven projects in the biotechnology arena have also received funding through Neotec grants, which helps fund new business projects requiring the use of technologies or developed from research activity, when the business strategy is based on technological development. This includes two projects from the Neotec call specifically for women entrepreneurs.

	Number of projects	Total budget (€)	Total awarded (€)	Non-repayable portion/ subsidy (€)	Repayable portion (€)
R&D projects approved in the biotechnology arena	20	14,064,225	9,754,925	6,161,071	3,593,855
Neotec grants	7	2,879,736	2,005,978	2,005,978	0
Total	27	16,943,961	11,760,903	8,167,048	3,593,855

TABLE 2.6.
R&D projects approved in the biotechnology arena. 2022.
Source: CDTI.

EVOLUTION OF PROJECTS FUNDED BY THE CDTI IN THE BIOTECHNOLOGY ARENA

Analysis of the evolution of funding for CDTI projects between 2012 and 2022 looks at the biotechnology R&D projects approved for funding through grants, repayable and partially repayable aid each year.

The projects selected are limited to the strictly biotechnological arena and the areas considered were restricted exclusively to biotechnology for health, systems biology, synthetic biology and nanotechnology, industrial biotechnology and biotechnology for agrifood.

Of projects approved in 2022, a significant portion were in the grant programmes: 13 of the 27 projects approved correspond to this type of programme. This means the non-repayable portion (grant) is much higher than the repayable portion (loan), with €8.17 million compared to €3.6 million.

Furthermore, this leads to an increase in the non-repayable portion based on the grant awarded, which was 69% compared to 55% the previous year.



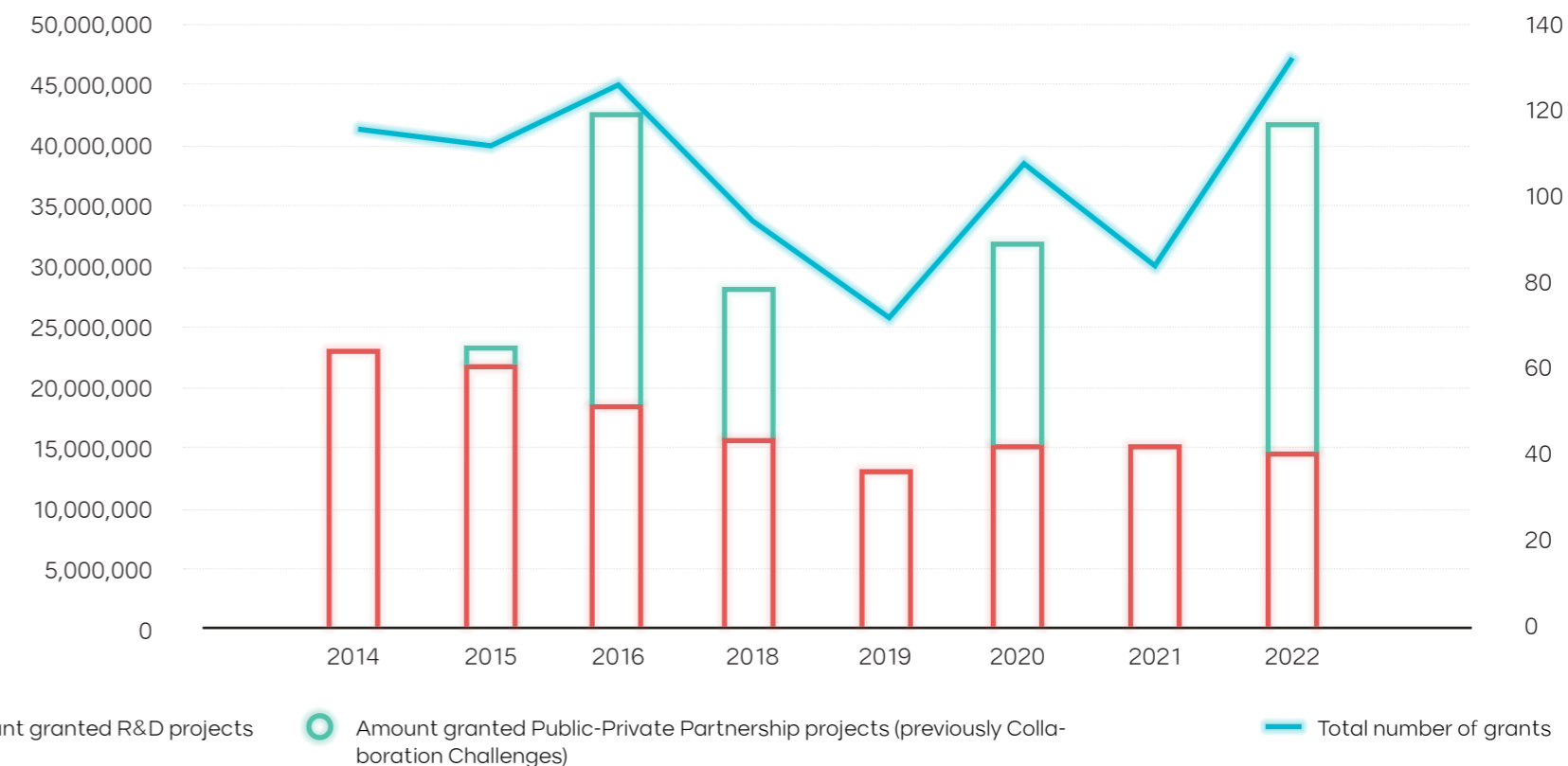
GRAPH 2.6.
Evolution of R&D projects approved in the biotechnology arena. (2012-2022). Source: CDTI.

EVOLUTION OF PROJECTS FUNDED BY THE SPANISH STATE RESEARCH AGENCY IN THE BIOTECHNOLOGY ARENA

Graph 2.7 shows the evolution of the number of grants and the total amount granted by the AEI in the biotechnology sector between 2014 and 2022.

These grants fall under the 2021 Knowledge Generation projects and the 2021 Public-Private Partnership projects (previously Collaboration Challenges) of the State Programme to Promote Scientific-Technical Research and its Transfer.

If we compare 2022 and 2020, which was the last year a Collaboration Challenges call was held, we see a considerable increase both in the total amount awarded and the number of projects funded. Regarding the amounts awarded, the grant total for R&D projects remained practically the same, but Public-Private Partnership projects secured nearly €10 million more in 2022 than the Collaboration Challenges projects in 2020. In terms of the number of projects, there was also an overall increase, rising from 109 to 133 projects.



GRAPH 2.7.
Evolution of R&D projects approved in the biotechnology arena. (2014-2022). Source: Compiled internally from AEI data.



The human genome, key in advancing medicine

There is no company more committed to using genetics to advance medicine than Amgen. Since the company was founded in 1980, we have known that the future of treating and curing many diseases lies in a deep understanding of our DNA and its mutations. So, seven of the first drugs we developed used genes cloned for the first time in the company's labs.

This belief that human genetics could revolutionise the search for new therapies led us to make several important decisions. One of them was to channel our research efforts into programmes to develop new therapies based on genetic advances validated in humans. To reinforce this strategy, in 2012 we acquired Icelandic company deCODE Genetics, a pioneer in collecting and analysing human DNA starting well before the first sequencing of the human genome had been completed.

The research done at deCODE, which celebrated its 25th anniversary in 2022, has been key to our work at Amgen, because a better understanding of the impact of human diversity on diseases allows us to improve and accelerate drug development and discovery.

So, in recent years we've conducted one of the most ambitious studies in the history of the industry. Our goal was to show that validation of human genetics can help lower the failure rate for the pharmaceutical research process. The results have confirmed that using genetics in combination with molecular biology and protein engineering is an important step in this direction.

The biology revealed by genetics unlocks key knowledge for explaining the biological complexity of the human body and the origin of many diseases. At the same time, however, interpreting this new information poses a significant challenge for researchers.

Despite the challenges of this new strategy, our commitment to genetics has only become stronger over the years. The new technology platforms we use to analyse gene functions and identify the ones involved in diseases are becoming increasingly sophisticated.

The pace of change in the biological sciences is increasing: the work scientists can do in a day now was unimaginable just five or ten years ago. Human genetics exemplifies this fast progress, as do the tools available now for turning that knowledge into new therapies.

One of these tools is ultra-fast DNA sequencing, which has allowed us to speed up identification of genetic mutations strongly tied to increased risk of cardiovascular and inflammatory diseases and several types of cancer. Determining which molecular defects are truly responsible for a disease gives our researchers more tools for designing new biological models to inhibit those genes. For oncology research, we use tools from human genetics to identify tumour cells or tumour suppressor genes. One example is our advances in immunotherapy, a type of cancer treatment that boosts the body's defences so it can find and destroy cancer cells.

Another great breakthrough in genetics is CRISPR, a simple, versatile, extremely powerful tool for editing DNA in any type of cell. It allows us to modify or correct underlying mutations in the genome associated with a disease.

Thanks to this and other emerging techniques, coupled with our potential to transform genetic knowledge, we have been able to increase the probability of success and effectiveness of our trials. Furthermore, we have cut drug discovery and development time, which means our medications can reach patients or be expanded to new indications much more quickly.

We're deep in the present of the future of medicine and it is very bright.

Miquel Balcells



Biotechnology and deep tech: a winning pair

Biotechnology has been an integral part of our industries for decades, helping develop new drugs, therapies and products that have substantially improved our lives. Nevertheless, the recent emergence of deep tech is significantly transforming the biotechnology industry, notably expanding its potential for innovation and discovery. By using cutting-edge research tools in fields like artificial intelligence (AI), machine learning and big data analysis, biotechnology researchers can compile information on complex biological processes and develop novel treatments previously considered out of reach.

In recent years, we've seen a progressive increase in the number of companies developing disruptive solutions based on deep tech. Solutions based on scientific discovery that, by incorporating these technologies, have the potential to address many of the great challenges facing our society. So, environmental and medical challenges can be re-examined in light of these technologies, significantly improving our outlook on the future. Additionally, the disruptive potential of deep tech makes them candidates for creating new markets or radically changing current ones. This will lead to huge business opportunities that we must take advantage of.

At IQS we work very hard to drive innovation and discovery in the biotechnology industry. We're aware that deep tech is going to substantially transform the biotechnology sce-

ne and we want to help support this development in several ways. First of all, through R&D. At IQS we promote research at the crossroads of biotechnology and deep tech, exploring new areas of discovery such as nanomaterials, biocatalysts and bioinformatics, generating knowledge that can be applied to develop new solutions in fields such as medicine and materials science. Plus, we work with industry partners and other interested parties to make sure these innovations are in line with the needs of the industry around us.

We also work to train the future experts that the industry is going to need. At IQS we contribute to the development of deep tech in biotechnology by providing education and training for the next generation of experts. We offer innovative programmes on the latest advances in biotechnology and deep tech, giving students the skills and knowledge they need to face the complex challenges of the biotechnology industry of tomorrow. Our programmes include courses on AI, machine learning, data science, robotics and other areas that are essential to the development of this discipline. In this regard, our Biotechnology, Bioengineering and Biomedicine programmes are pioneers in implementing some of these advanced technologies.

Another key aspect for us is fostering and supporting entrepreneurial spirit among our students, professors and researchers. Through our business accelerator, IQS Tech Fac-

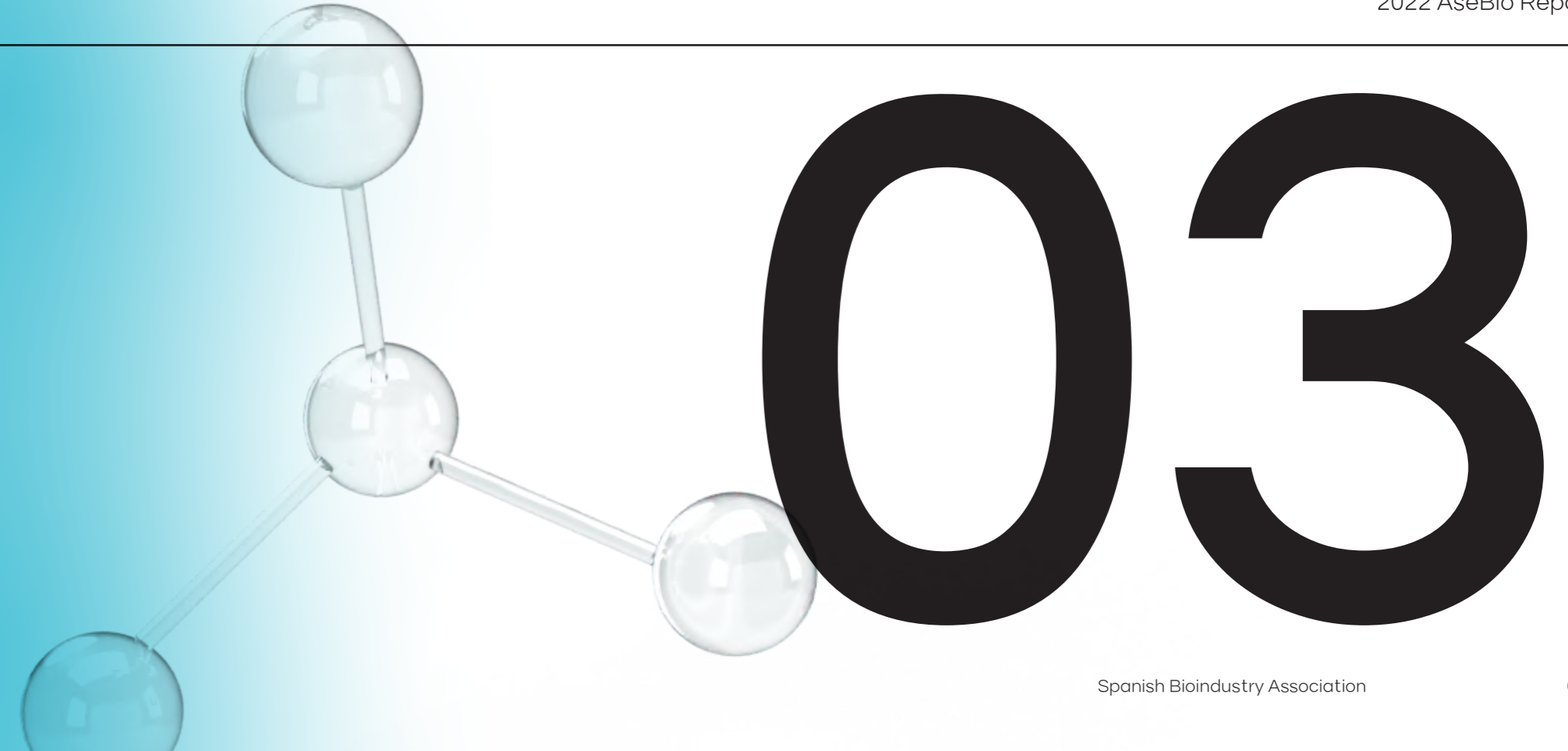
tory, we drive development of deep tech in biotechnology. We work to provide the resources and support needed to turn innovative ideas into successful businesses and seek to consolidate a portfolio of start-ups that foster innovation and fuel the growth of the biotechnology industry.

Finally, we want to wish all our colleagues in the biotechnology industry much success this year and we look forward to seeing you at BIOSPAIN!

Arnau Pla, PhD
Business Development Manager



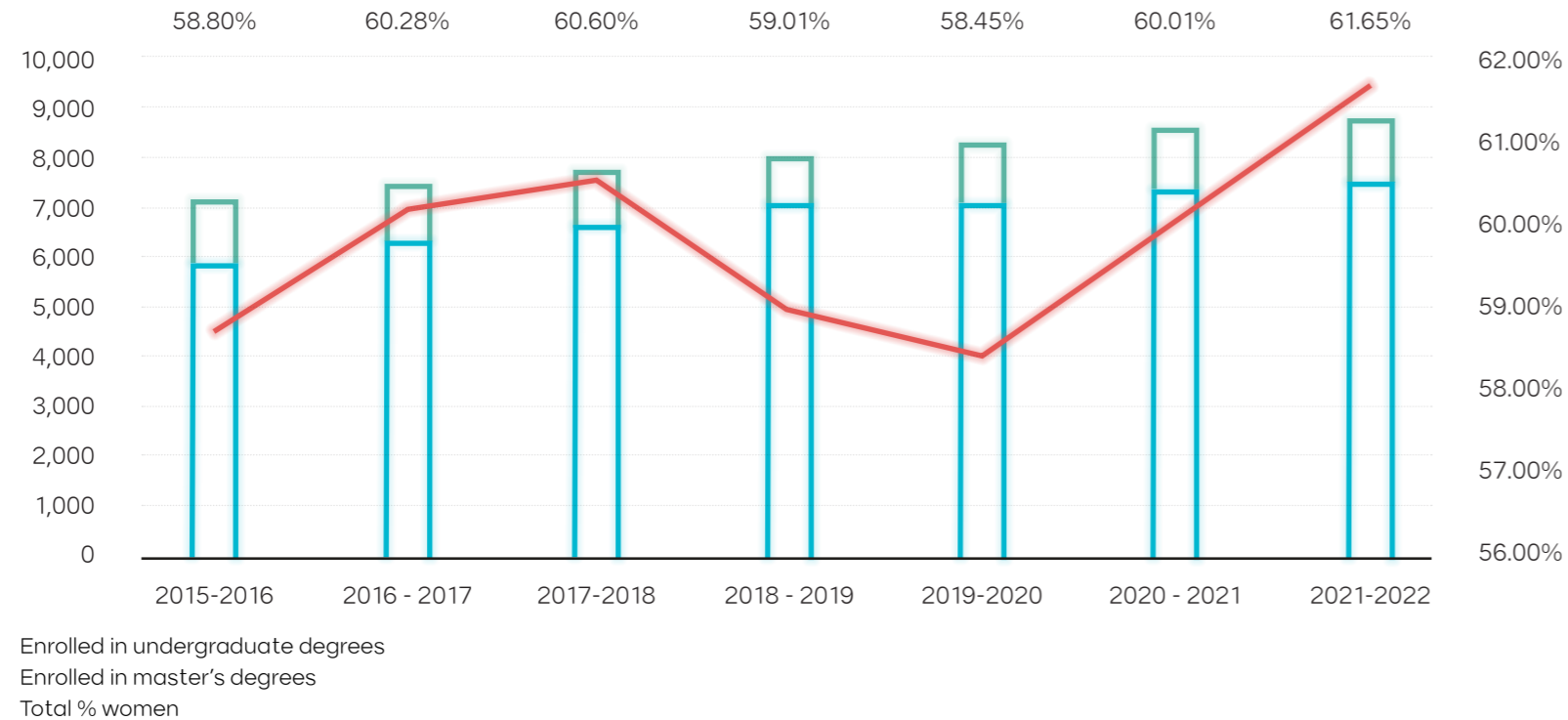
TALENT AND DIVERSITY



INTEREST IN BIOTECHNOLOGY STUDIES INCREASES, ESPECIALLY AMONG WOMEN

More and more students are seeking out their professional future in biotechnology (graph 3.1). Since the 2015-2016 academic year, the number of students enrolled in university studies in biotechnology, both undergraduate and masters level, has increased roughly 25%. In 2021-2022, the latest academic year for which data is available, there were more than 8,900 students in total, including undergraduate and masters studies.

Of these 8,900 students, the number of women increased again, up 3% from the previous year, making up 62% of the total.



GRAPH 3.1.
Evolution of number of students enrolled in university studies in biotechnology (undergraduate and master) 2015-2022.
Source: Compiled internally from the Statistics on University Students of the Ministry of Science, Innovation and Universities.

● Enrolled in undergraduate degrees
● Enrolled in master's degrees
— Total % women

BIOTECHNOLOGY IS AMONG THE DEGREES THAT REQUIRE THE HIGHEST MARKS ON UNIVERSITY ENTRANCE EXAMS

Biotechnology degrees remained among the toughest degrees to get into in 2022, among the top 10 admissions scores required at 21 of the 24 public universities that offer this undergraduate degree.

Dual degrees that include biotechnology with related disciplines like pharmacy, molecular biology, bioinformatics, data science and other types of engineering, are, on average, among the top four highest admissions scores required.

This is similar for directly related degree programmes, such as biomedical engineering, which is also among the top 10 admissions scores at 15 of the 20 public universities that offer this degree.

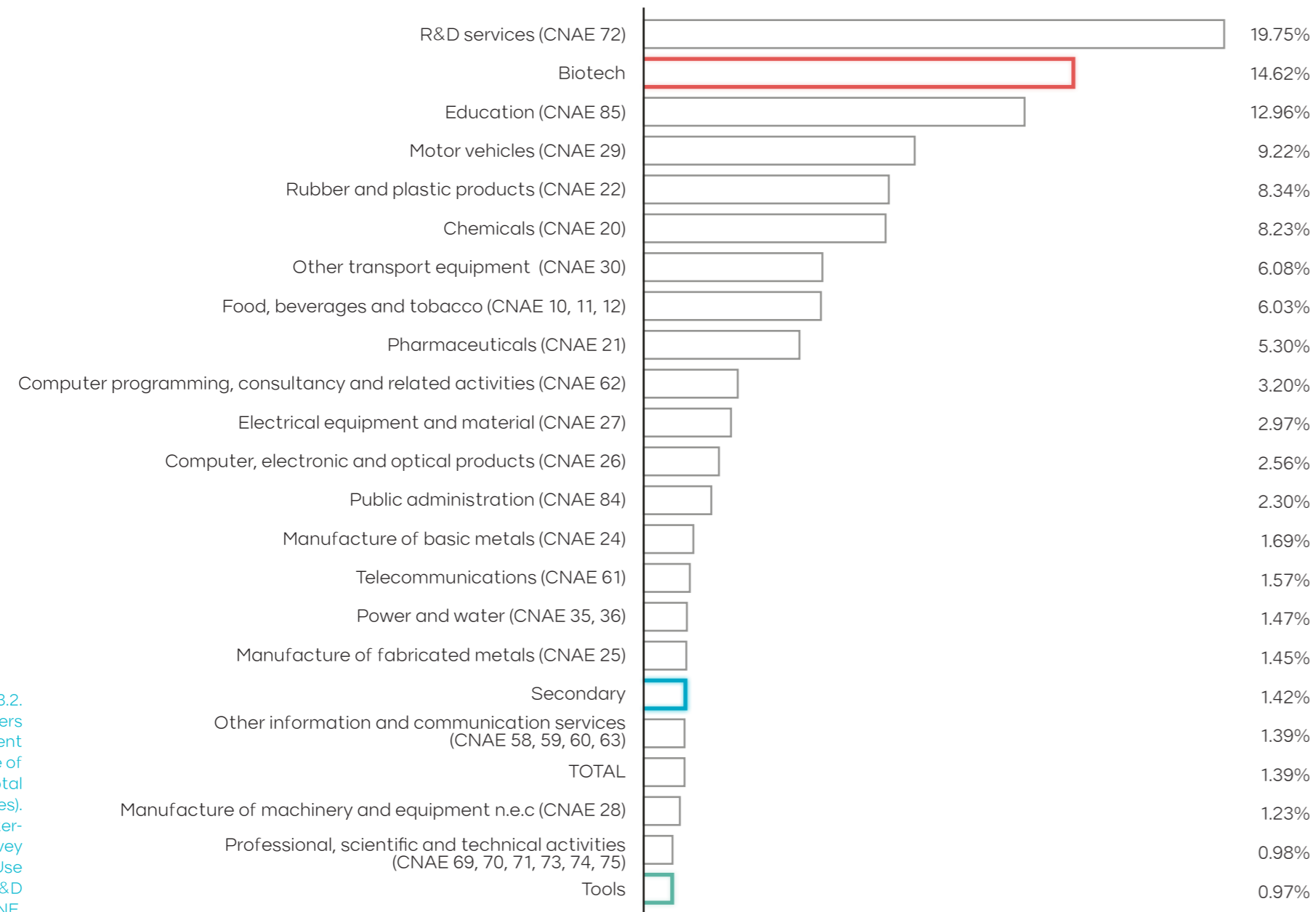
Additionally, more and more universities offer degrees related to biotechnology or in combination with other degrees with increasing demand, such as nanotechnology, mechanical engineering, telecommunications, process innovation and food technology, among others. In this year's query, over 18 public universities now offer these degrees.

BIOTECH FIRMS EMPLOY THE MOST RESEARCHERS

Biotech companies once again have the highest percentage of researchers to total employees in the sector, surpassed only by R&D services companies, with researchers making up 14.62% of all employees.

At companies with biotechnology as a secondary activity, 1.42% of employees are researchers, which is slightly higher than the average for all sectors. On the other hand, companies that use biotechnology as a production tool saw the ratio of researchers to total employees decrease (0.97%), dropping below the total average (1.39%).

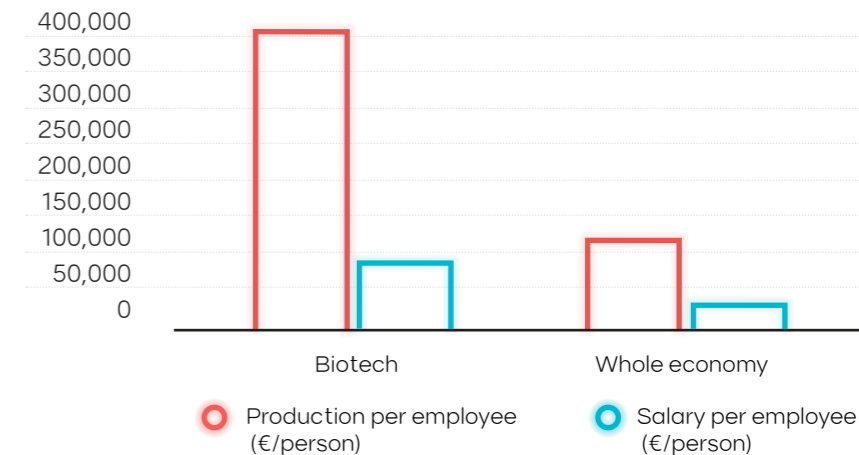
GRAPH 3.2.
Ratio of researchers to total employment in 2021 (percentage of researchers to total employees).
Source: Compiled internally from 2021 Survey on Biotechnology Use and Statistics on R&D activities. INE.



THE SALARY PER EMPLOYEE AT BIOTECH FIRMS IS NEARLY DOUBLE THE NATIONAL AVERAGE

The salary per employee at biotech firms is practically double the Spanish average at nearly €64,000 per worker (graph 3.3).

The average productivity at biotech firms is three times higher than for the Spanish economy as a whole. For biotech firms it is €379,131 compared to €117,031 on average.

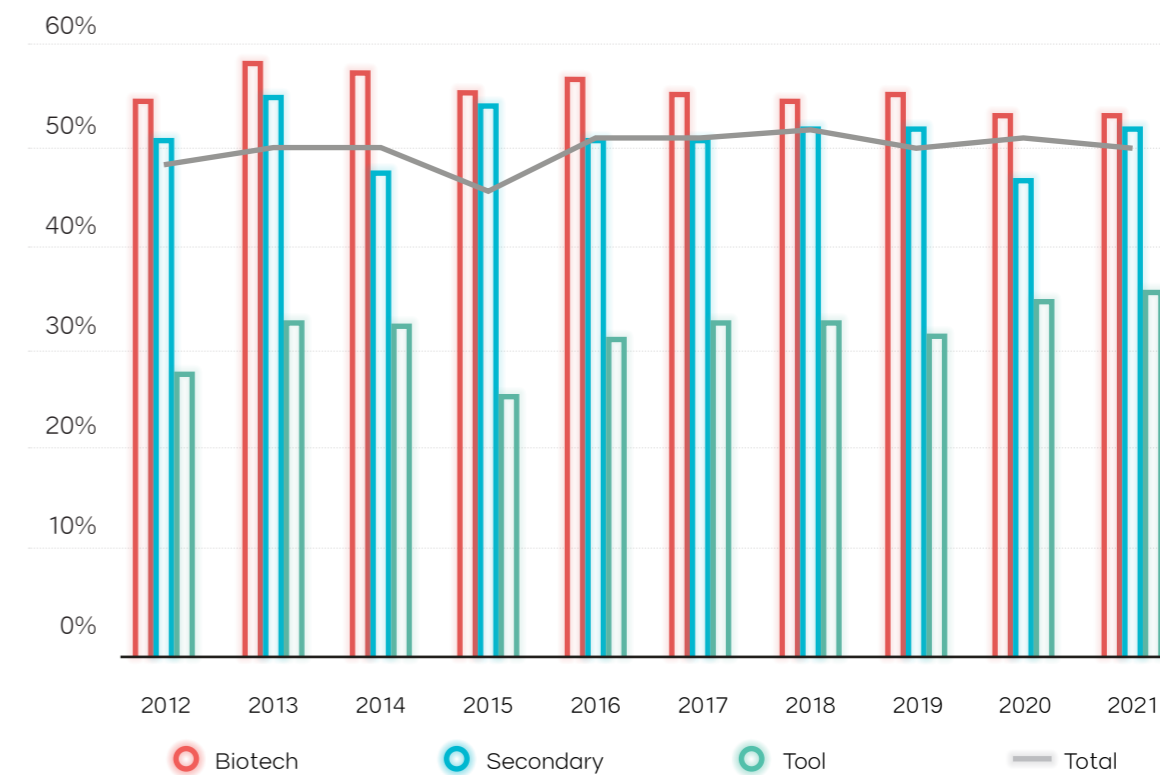


GRAPH 3.3.
Basic productivity and salary ratios for employees at biotech firms. 2021. Source: Compiled internally from the information on companies collected by AseBio.

WOMEN MAKE UP 53% OF TOTAL EMPLOYMENT IN BIOTECHNOLOGY

Female participation in the sector has held steady in recent years at slightly above 50%.

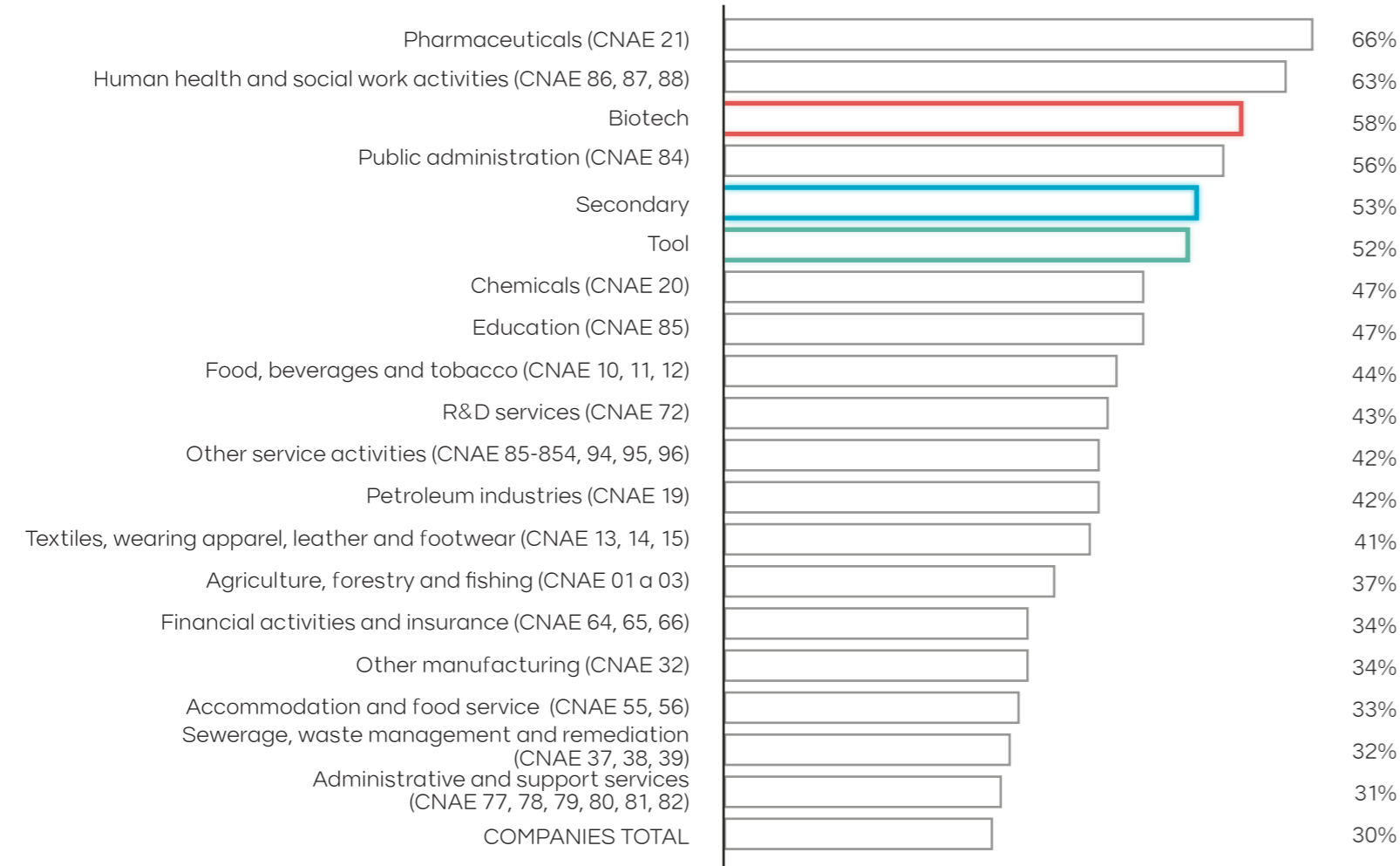
At biotech companies, the percentage of women remained the same as in 2020: 53%. At companies with biotechnology as a secondary activity, it rose slightly from 47% to 52%. On the other hand, companies that use biotechnology as a tool have the lowest percentages but they have been rising non-stop for the past three years, from 32% in 2019 to 37% in 2021.



GRAPH 3.4.
Evolution of female presence in biotechnology activities compared to total employment in biotechnology. Source: Compiled internally from Survey on Biotechnology Use. INE.

WOMEN MAKE UP 58% OF R&D STAFF AT BIOTECH COMPANIES

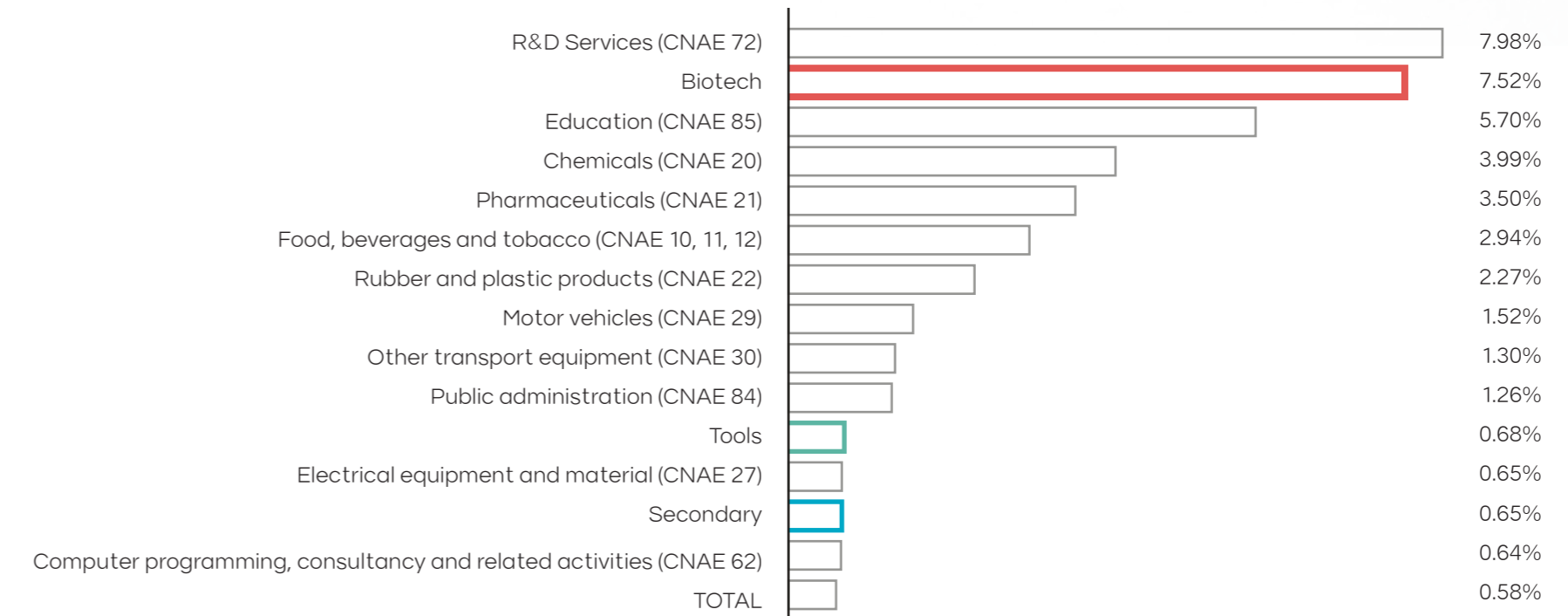
On the ranking of women working in R&D as a percentage of total R&D staff, biotech companies remained third among all sectors of activity in the Spanish economy, with 58%, behind pharmaceutical activities and healthcare and social services. Plus, this percentage is well above the average for the economy as a whole, which is 30% (graph 3.5).



GRAPH 3.5. Percentage of women to total R&D personnel. Source: Compiled internally from the 2021 Survey on Biotechnology Use and Statistics on R&D activities. INE.

Biotech firms have the highest ratio of female researchers, technicians and assistants to total employment of any branch of activity.

At Biotech firms, female researchers make up 7.52% of all employment, making them second after R&D services. Plus, female technicians and assistants make up an additional 6% of total employees and in this segment they lead all areas of economic activity.



GRAPH 3.6. Ratio of female researchers to total employment in 2021 (percentage of female researchers to total employees). Source: Compiled internally from 2021 Survey on Biotechnology Use and Statistics on R&D activities. INE.



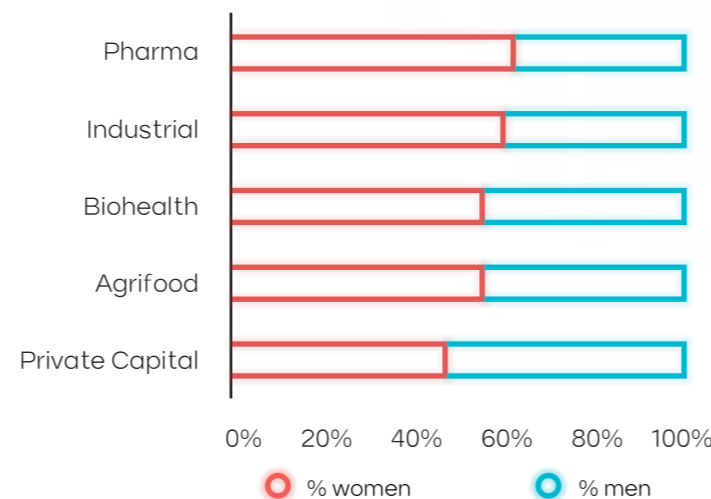
FEMALE PARTICIPATION IN BIOTECHNOLOGY INDUSTRY

WOMEN MAKE UP 60% OF STAFF AT BIOTECHNOLOGY COMPANIES

Previously, we only had indicators on the percentage of women in R&D activities, thanks to the INE survey. So, for International Day of Women and Girls in Science on 11 February, AseBio surveyed member companies to get a detailed snapshot of women in the Spanish biotechnology industry.

The results of the study show that 60% of people working at biotechnology companies are women and there is little difference between the percentage at small and large companies. And if we look at the breakdown by the companies' area of activity, there are some variations: biopharmaceutical and industrial biotechnology companies have a higher percentage of women on staff.

GRAPH 3.7. Percentage of women by type of company. Source: AseBio.



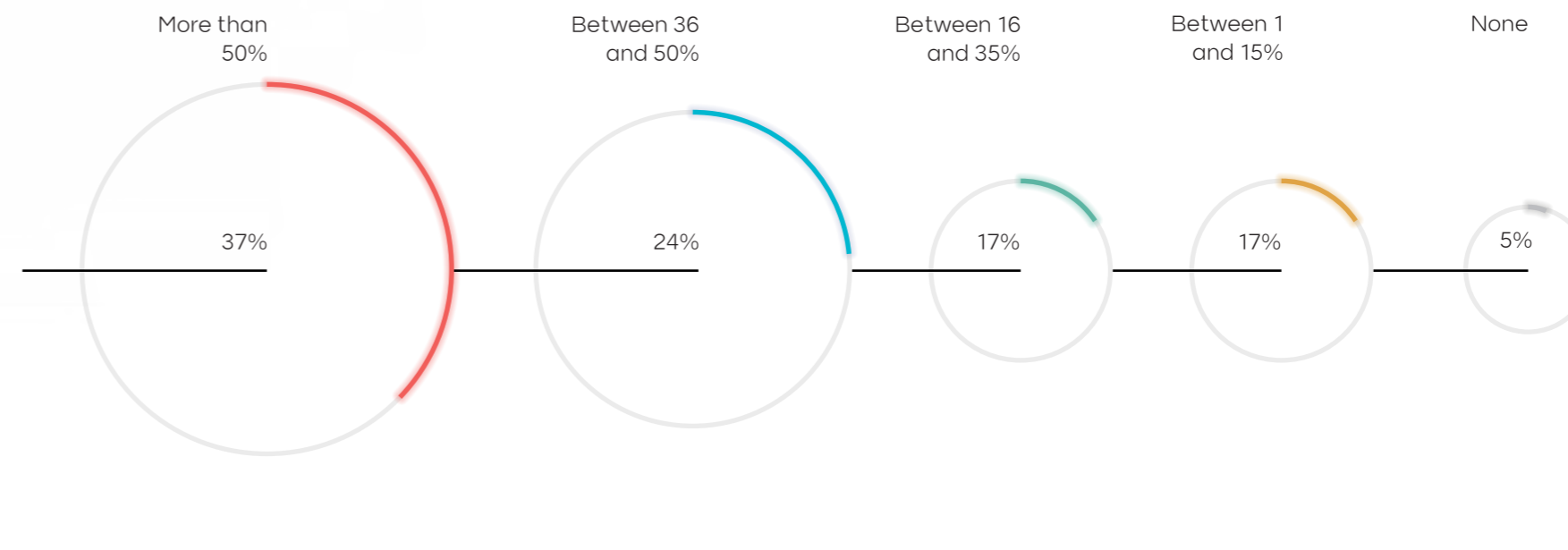
Plus, regulatory and clinical development departments have the highest percentage of women. The areas with the fewest women are production and management.

Member companies were also asked about the level of education of their female employees. They reported that 98% of the women have university studies and nearly 60% have an undergraduate degree. If we break the data down by size of company, small firms have the highest percentage of women with PhDs. This could be due to the fact that many companies are created based on academic research and get grants to hire Industrial PhD candidates. On the other hand, the largest companies have the most female employees with undergraduate degrees.

In terms of leadership, 37% of the companies surveyed reported that women hold more than 50% of leadership positions. And by company size, the biggest have the most women in positions of leadership.

As we didn't previously have indicators on the percentage of women at private capital management firms that invest in the biotech sector, AseBio decided to analyse this in detail. The data show that 48% of the staff are women. However, a recent study conducted by the Association on private capital analysing the percentage of women at management firms in all sectors shows that just 30% have more than 35% women on staff.

The full report is available here: <https://www.asebio.com/estudio-participacion-mujeres-biotech>



GRAPH 3.8. Percentage of women in leadership positions. Source: AseBio.

WOMEN MAKE UP 28.4% OF EXECUTIVE TEAMS AT BIOTECHNOLOGY FIRMS

According to the INE Economically Active Population Survey, in 2021 women made up 46% of total employment but held only 33% of executive and management positions. On the IBEX-35, only two companies have a female chairperson or CEO.

For biotech companies, this gender gap is narrower. Women make up 14.3% of chairpersons, 22.7% of CEOs and 28.4% of executive teams. In all of these cases, the percentage of women is much higher at biotechnology companies than IBEX-35 companies.

	% WOMEN	
	Biotech	IBEX-35(*)
Chairperson	14.3%	5.9%
CEO	22.7%	4.5%
Executive teams	28.4%	16.6%

TABLE 3.1. Female presence in management teams at biotech companies in 2021. Source: Compiled internally from the Companies House registry and companies' websites. (*) Data from the INE and Institute of Women. Ministry of Equality.





BTI: Biotechnology serving the people

For 30 years, we have been travelling the path from intuition to evidence. An inspiring, innovative project in biomedicine and biotechnology to develop a new generation of personalised medicines to regenerate and repair tissues and organs. A path on which we set out with a dream: that the growth factor and human fibrin in our platelets and plasma could be used therapeutically. Today that dream has become reality. We've made this treatment universal, proven scientifically and clinically the efficacy and safety of biological therapies, shared it with professionals in all areas of medicine and, clearly the most valuable, properly cared for millions of patients all over the world. Millions of positive outcomes that by far make up for the complexity of an endeavour that combines science, entrepreneurship and putting together talented multidisciplinary work teams, leading to profound benefits for healthcare, the economy and society in general.

As global pioneers in therapeutic application of plasma rich in growth factors (PRGF-Endoret®), we've revolutionised personalised medicine by creating biological medicines that

regenerate bone and soft tissue in the oral cavity and encourage implant integration into the bone bed, accelerating dental recovery. We were the first in the world to use plasma rich in growth factors in orthopaedics and sports medicine, applying fibrin and growth factors for an endless number of tissue injuries in tendons, muscles, ligaments, cartilage and more. I remember fondly the milestone of establishing a protocol for degenerative and chronic pathologies, soon after developing an effective functional treatment to alleviate the symptoms of osteoarthritis that was named best clinical trial of the year by the journal *Arthroscopy*.

No less impactful was the innovation in the field of haemoderivatives for ophthalmology, manufacturing the first 100% autologous eye drops based on growth factors to treat dry eye, or in dermatology, healing vascular ulcers efficiently and pharmacoeconomically.

More recently, we've tackled chronic back pain, treating intervertebral discs with plasma, and we've just set off on an exciting path in reproductive medicine, with a treatment to boost

the pregnancy rate of women with failed embryo implantation. A series of biological therapies that were inspired by studying biological processes involved in bone regeneration after a dental extraction and that will be applied in new areas of medicine in the future.

Looking back, I remember the three founding pillars of BTI: humanise biotechnology, generate scientific knowledge and develop therapeutic solutions to improve people's quality of life. At BTI today, what others call deep tech we refer to as Human Technology.

Dr Eduardo Anitua.
President of BTI Biotechnology Institute



BUSINESS FABRIC

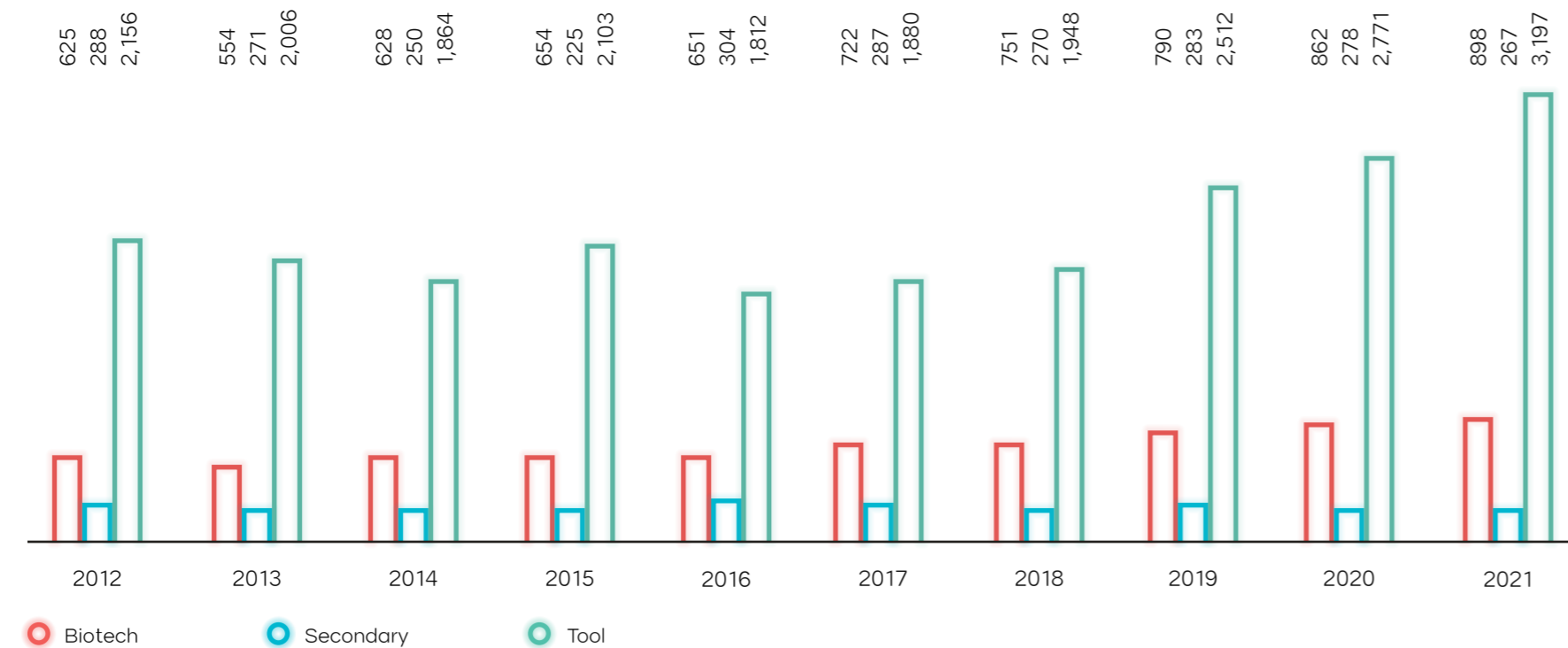
2022 AseBio Report

04

4,362 COMPANIES CARRY OUT BIOTECHNOLOGY ACTIVITIES IN SPAIN, 898 OF WHICH ARE BIOTECH FIRMS

After a considerable increase in the number of companies in the sector in 2019, growth stabilised in 2020 at 9%. This stable growth continued in 2021, at 11.5%. This meant an increase in the ratio of biotechnology companies to the total, with a record of nearly 3 biotechnology companies per 1,000 businesses in our country.

Biotech firms were up 4.2% in 2021, with 898 companies. Companies with biotechnology as a secondary activity dropped 3.9% and companies that use it as a production tool increased 15.4%, being the segment with the highest growth.



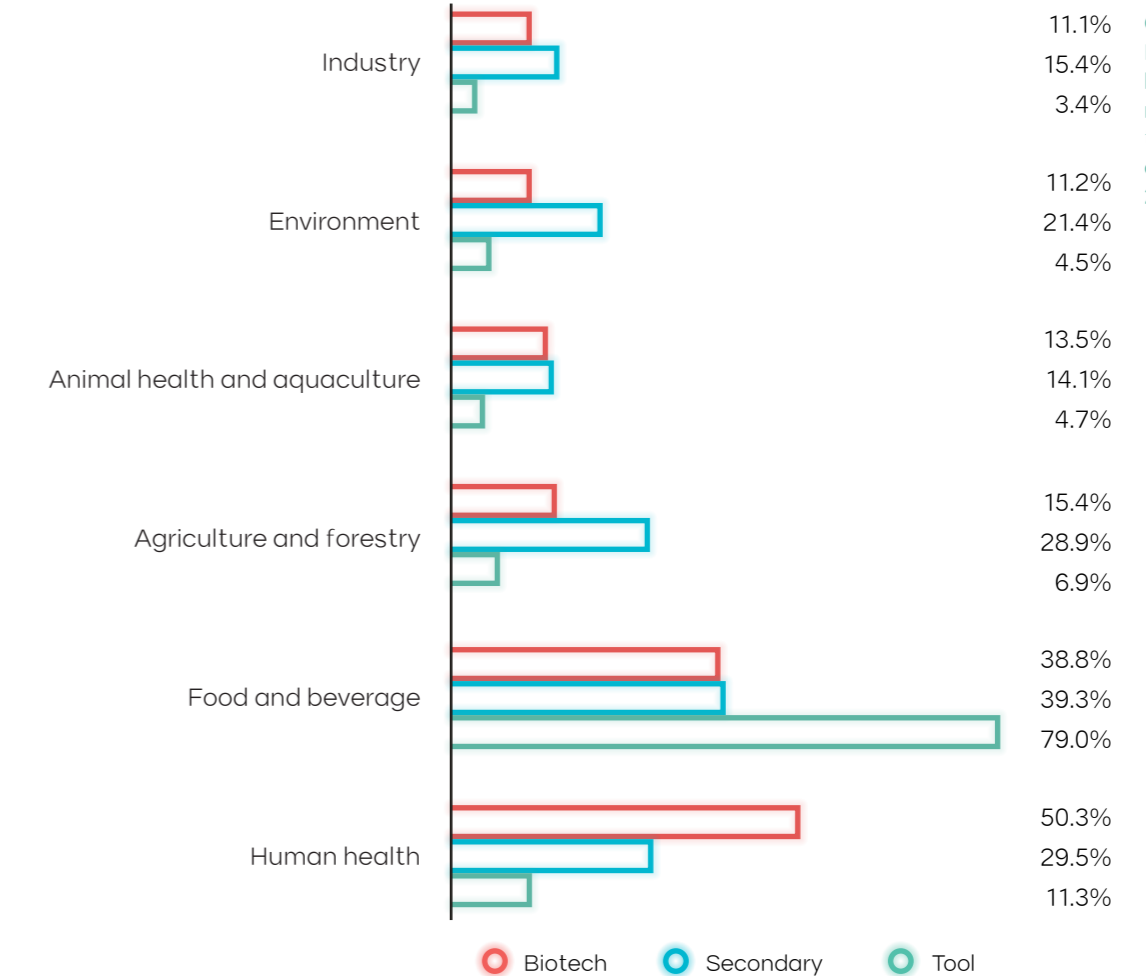
GRAPH 4.1. Evolution of the number of biotechnology companies. Source: Compiled internally from Survey on Biotechnology Use. INE. and AseBio lists.

HUMAN HEALTH AND FOOD CONTINUE TO BE THE MAIN FOCUS FOR BIOTECH COMPANIES

Human health is the main area of activity for biotech firms at over 50%, followed by food (39%) and activities related to agriculture and forestry production (15.4%) (graph 4.2).

Companies with biotechnology as a secondary activity, however, are more equally distributed among food (40%), human health (30%) and agriculture and forestry production (30%).

Finally, if we look at the breakdown of companies that use biotechnology as a production tool, we see that nearly 80% focus on food and 11% on human health.



GRAPH 4.2. Breakdown of biotechnology companies by area of application. Source: INE. Survey on Biotechnology Use. 2021.



96% OF BIOTECH COMPANIES ARE MICRO SMES AND SMES

Nearly all biotech companies are micro-SMEs or SMEs. Plus, this has become even more pronounced over the past year, with an increase in the percentage of micro-SMEs.

Of the 898 companies, 54% are micro-SMEs with fewer than 10 employees and make up only 2.1% of total turnover. Small companies, with 10 to 49 employees, make up 30% of the companies and 10.8% of turnover.

Medium-sized companies, with 50 to 249 employees, make up 13% and nearly 40% of joint turnover. The 30 large corporations, over 250 employees, have an average turnover of more than €219 million and make up 50% of joint turnover.

	Number of companies	% of total	Average turnover (€ millions)	% of total turnover
Micro-SME (fewer than 10 employees)	575	53.7%	0.5	2.1%
Small (10 to 49)	204	29.3%	6.9	10.8%
Medium (50 to 249)	89	12.8%	54	36.8%
Large (more than 250)	30	4.3%	219	50.4%
TOTAL	898	100%	14.5	100%

TABLE 4.1. Breakdown of biotech firms by size. Source: Compiled internally from the information on companies collected by AseBio. 2021.

CATALONIA, LEADING REGION IN BIOTECH COMPANIES AND MADRID, IN AVERAGE TURNOVER

Catalonia is the leading region in number of companies with 24.5% of the national total, followed by Madrid with 17% and Andalusia with 14%. The next tier includes the Basque Country (9.7%), Valencian Community (8.9%) and Galicia (7.02%).

Catalonia also leads in turnover with 45% of the total. It is followed by Madrid with 33%. Madrid leads in average turnover, followed by Catalonia and Aragon.

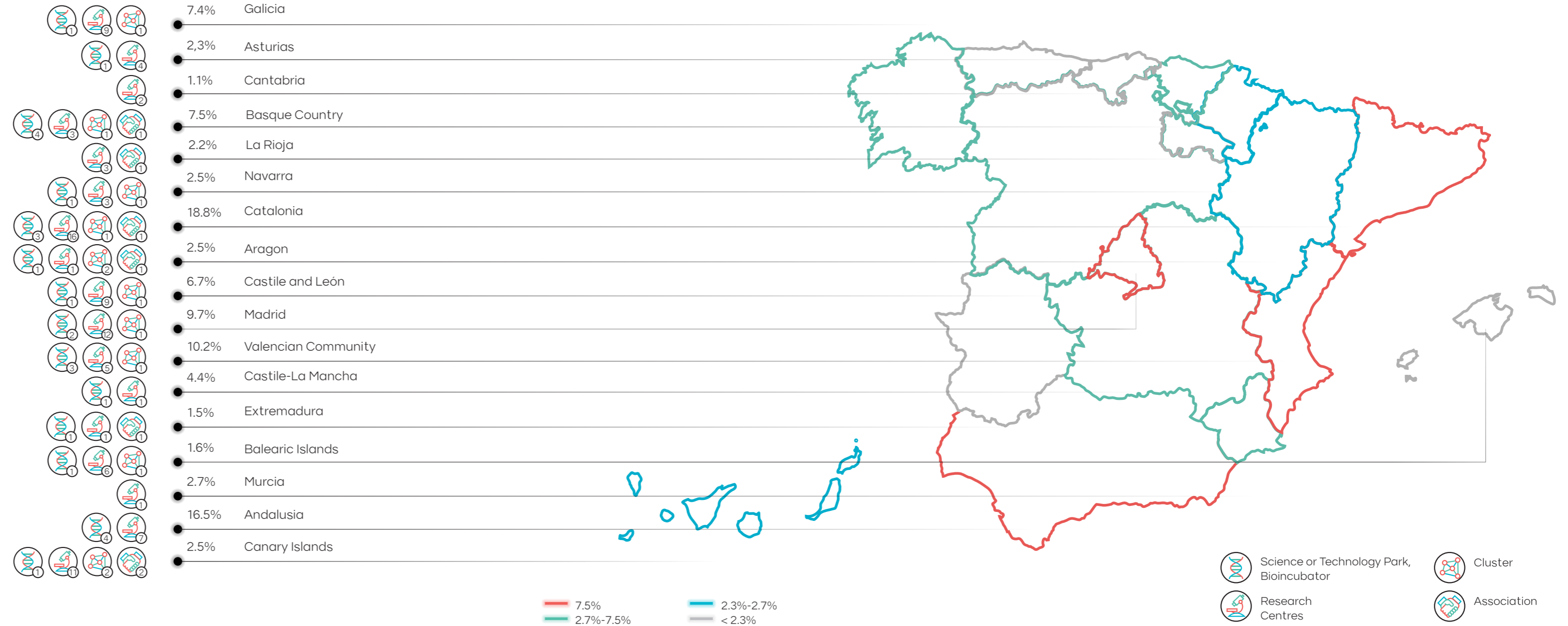
Finally, by percentage of the sector's Gross Added Value (GVA) to the regional GDP, Catalonia leads with 0.84%, followed by Aragon and Madrid with 0.63% each.

	Number of companies	% of total	Average turnover (€ millions)	% of total turnover	GVA in % of regional total
Andalusia	122	13.59%	5.4	5.02%	0.22%
Aragon	18	2.00%	26.9	3.71%	0.63%
Asturias	19	2.12%	0.6	0.08%	0.02%
Balearic Islands	13	1.45%	0.3	0.03%	0.01%
Canary Islands	7	0.78%	0.5	0.03%	0.01%
Cantabria	8	0.89%	18.0	1.11%	0.40%
Castile and León	33	3.67%	7.1	1.79%	0.20%
Castile-La Mancha	8	0.89%	6.1	0.37%	0.04%
Catalonia	220	24.50%	27.2	45.88%	0.84%
Valencian Comm.	80	8.91%	4.4	2.72%	0.12%
Extremadura	7	0.78%	2.8	0.15%	0.07%
Galicia	63	7.02%	7.2	3.49%	0.20%
Madrid	152	16.93%	28.5	33.20%	0.63%
Murcia	25	2.78%	1.2	0.23%	0.05%
Navarra	29	3.23%	3.3	0.73%	0.26%
Basque Country	87	9.69%	2.1	1.42%	0.16%
La Rioja	7	0.78%	0.5	0.03%	0.04%
TOTAL	898	100%	14.5	100%	0.39%

TABLE 4.2. Territorial breakdown of biotech firms. Source: Compiled internally from the information on companies collected by AseBio. 2021.

Graph 4.3 shows the distribution of biotech companies by Autonomous Community and the biotechnology-related facilities in each one, including technology parks, business associations, sector clusters and research centres.

In terms of the biotechnology ecosystem, Catalonia is at the top, followed by the Community of Madrid, Canary Islands, Andalusia, Castile and León and Galicia.



GRAPH 4.3. Territorial breakdown of biotech firms and biotechnology-related facilities. Source: Compiled internally. 2021.

TABLE 4.3. Companies devoted to biotechnology that began working in 2022. Source: AseBio, with collaboration from IDEA Agency, CEEI Asturias, BioAsturias, Bioibal, Oficina de Transparencia y Buen Gobierno de la Junta de Castilla La Mancha, Albacete Technology Park, University of Castile-La Mancha Vice-chancellor for Research and Scientific Policy, Instituto para la Competitividad Empresarial de la Junta de Castilla y León, BIOCAT, Fundecyt - Science and Technology Park of Extremadura, Axencia Galega de Innovación, Bioga, Directorate General of Innovation, Industry and Commerce of La Rioja, Knowledge Foundation Madri+d, Madrid Science Park, Institute for the Promotion the Region of Murcia, General Directorate for Industry, Energy and Innovation of the Government of Navarra, CEIN, SODENA, SPRI, CEEI Valencia and BIOVAL.

IN THE PAST DECADE, 48 NEW COMPANIES HAVE BEEN CREATED A YEAR, ON AVERAGE

At AseBio we constantly monitor the sector to identify new companies created that focus on biotechnology. In the past year, 62 new biotech firms were identified, 19 more than published in the 2021 AseBio Report.

Of these companies, 11 were set up in Catalonia, 9 in Galicia, 6 each in the Basque Country and Madrid, and Castile-La Mancha and Valencia stand out with 5 each. Table 4.3 shows their activity, company name and the Autonomous Community where they are located.

Company name	Autonomous Community	Activity
3CL-Bio	Catalonia	Development of a new Covid-19 treatment that can be administered orally at primary care centres.
Activa Biotech	Asturias	Research to detect biomarkers in dry blood samples to prevent chronic diseases, improve physical performance of athletes and improve people's health by optimising the balance of micro-nutrients and other particularly important molecules.
AEROFYBERS	Catalonia	Cellulose aerogels with significantly better mechanical performance and water resistance.
Airbiometrics Advanced Solutions	Valencian Community	Research and development of disruptive solutions for the biomedical arena, technological innovation and precision medicine.
Algemy	Catalonia	Biorefinery of microalgae to obtain sustainable ingredients and products for use in nutrition, personal care and plant biostimulants.
Antiviral Protection	Valencian Community	Development of antimicrobial coatings and paints to protect all sorts of surfaces from hazardous microorganisms like viruses, bacteria and fungi on a lasting basis.
Aptadegrad	Galicia	Platform to discover novel protein-degrader compounds based on the combination of an aptamer and a degrader, that harnesses protein degradation pathways within the cells.
AtG Therapeutics	Catalonia	Discovery of targets for metabolic adaptation and development of therapeutic medicines and biomarkers to treat advanced cancer.

Company name	Autonomous Community	Activity
Betternostics	Navarra	Early oncology diagnostics for cancer in dogs and development of biotechnology tools to analyse markers for healthcare prevention and wellness in veterinary medicine and agrifood.
BioClonal	Aragon	Discovery of antibodies and provision of personalised solutions.
Bioherent	Andalusia	Sensitive, reliable test of allergies to drug in clinical setting.
Bioprocesia Circular Solutions	Murcia	Agrifood company with technology to transform the sector's waste into a new high-protein ingredient for animal feed.
Biot Microterapia	Basque Country	Development and commercialisation of diagnostic test and micro-biotherapy products.
Biotech Activities	Extremadura	Insect breeding, focused on improving processes that contribute to the circular economy, natural and sustainable protein sources from crickets.
Biottonia Naturalcare	Extremadura	Production of aromatic plants for essential oils, dehydrated products for condiments, obtaining extracts and active ingredients for nutraceuticals, pharmacy and cosmetics, and producing functional foods.
Blue Marine Oil	Galicia	Valorisation of waste and subproducts of fish, fruit and vegetables to obtain oils, nutrients and substrates with high value added for animal feed, the nutraceuticals market, cosmetics and agricultural fertilisers.
Cell Factory	Galicia	Research, development and commercialisation of biotechnology recipes to generate production for the food, cosmetics, pharmaceutical and chemical industries.
Celldrive 3D	Castile and León	Scientific and technical research to develop translational bio-inks for 3D bioprinting with biomedical applications.
Co2-Afp Engineering	Castile-La Mancha	Transforming the conventional alcoholic fermentation process.
Cocoon Bioscience	Community of Madrid	Use of insects in chrysalis state to produce bioactive proteins and enzymes for use in the food and health arena.
Cultzyme	Basque Country	Smart bioreactor for liquid fermentation for the food sector and cell cultures.

Company name	Autonomous Community	Activity
Diversa Technologies	Galicia	Drug delivery technology based on lipid nanoemulsions that can be used for safe, effective intracell administration of complex macromolecules and small hydrophobic molecules.
DXM Innopharma	Basque Country	Manufacturing system for personalised drugs and multi-drugs for polymedicated patients.
EmbryoCloud	Murcia	Research and development of natural culture media and biofluids for the field of Assisted Reproductive Technologies (ART) in various species.
Enzicas Bio	Galicia	Generation of a food additive by growing <i>Aspergillus oryzae</i> fungi on chestnut starch, to generate a biotechnology solution that cuts dairy and meat ageing times by one third.
Ergofito Ibérica	Extremadura	Development of biotechnology to eliminate contaminants without the need for costly infrastructures.
Ethicell	Asturias	Experimental research and development in biotechnology and the natural and technical sciences.
Euskal Oxcitas Biotek	Basque Country	Digital biotechnology to unearth the mechanisms of ageing.
Gene Vector	Catalonia	Development of lentiviral vectors to address unmet medical needs.
Hifas Innovation Hub	Galicia	Early discovery of drugs from fungi as a natural source of antibiotic compounds to fight resistant infections.
Hispalis Biolab	Andalusia	Molecular diagnostics to analyse samples from various species.
Hyssogenix	Navarra	Genetics lab specialising in dentistry.
Imstant Cosmeceutics	Asturias	Design and manufacturing of personalised cosmeceutical treatments based on digital cosmetic diagnosis, specific to each person.
Innerva Pharmaceuticals	Catalonia	Development of a new treatment for surface ocular pain.
Insectorium	Castile-La Mancha	Production of mealworms for use in animal feed.

Company name	Autonomous Community	Activity
Ivestatin Therapeutics	Catalonia	Creation of therapeutic solutions to reduce ischaemic damage using a multi-target cell protection mechanism.
KOA Biotech	Catalonia	Autonomous digital technology for use on site at fish farms to reduce fish mortality rates.
Lablineal 4mediks	Andalusia	Development of botanical active ingredients on an industrial scale to provide solutions that help improve people's lives in various arenas.
Lifesome Therapeutics	Community of Madrid	Nanotechnology that uses a multi-functional nanoparticle that can incorporate any drug, combining anti-tumour and anti-metastasis activity without toxicity.
Lucas Biotech	Murcia	Development of innovative, sustainable biotechnology solutions of great value for the challenges of modern agriculture. Includes biofertilisers, nutrients from algae and products that attract insects.
Medical Plasmas	Navarra	Creation of systems based on cold plasma at atmospheric pressure to treat chronic and acute wounds.
Mediterranean Algae Technologies	Valencian Community	Growing native Mediterranean macroalgae in a recirculation aquaculture system for use in cosmetics, nutraceuticals and fertilisers.
Mendel's Brain	Valencian Community	Direct genetic analysis specialising in human psychology that combines the fields of genetics, psychology and big data.
Metabolomirs	La Rioja	Development of algorithms to build triage models for diagnosing diseases, as well as identifying and commercialising biomarkers.
Método R Cosméticos	Asturias	Design, development and manufacturing of dermatology products for cosmetics and beauty products.
MOA Biotech	Navarra	B2B platform of ingredients obtained from food subproducts using a fermentation process optimised with an artificial intelligence tool.
Nano In Vitro Diagnostics	Catalonia	Use of nanosensors to detect diseases in humans, animals and the environment.
Nanocells Farms	Galicia	Innovation and development of production processes for synthesis of bacterial nanocellulose, industrial scale-up and application to production of high added value and technological value.
Nanological	Community of Madrid	Development of devices to identify pathogens based on nanotechnology.

Company name	Autonomous Community	Activity
NAPLATEC	Castile-La Mancha	Exploitation of patent by producing bioactive components characteristic of saffron in plants with high concentration of carotenoids.
New Exosomes Technology	Galicia	Research, development, manufacturing and commercialisation of products and services in the human and animal health arena, as well as analysis and research kits for the clinical and hospital sector.
Next-Gen Leather	Community of Madrid	Development of a biological and biodegradable material similar to leather.
Oniria Therapeutics	Catalonia	Development of TET2 inhibitors to eradicate latent tumour cells and TET2 activators that promote cell latency.
Proplantae Sanidad Vegetal	Galicia	Biotechnology lab for plant health and R&D focused on diagnosing plant diseases and prescribing sustainable treatments.
Shapypro	Castilla-La Mancha	Comprehensive services in areas of cosmetics, chemical antiseptics and disinfectants, health-care, food and quality products.
Succipro	Catalonia	Exploitation of the succinate-metabolic-inflammatory axis to create a novel, first-in class therapeutic for inflammatory and metabolic diseases.
Technopalm Elche	Valencian Community	Date-palm tissue culture laboratory.
Thytech	Community of Madrid	Use of thyTreg cells as cell therapy to prevent organ rejection and other conditions associated with inflammatory processes.
Vali Ai Europe	Basque Country	Development and commercialisation of a platform based on artificial intelligence technologies for cytogenetic karyotyping studies.
Villa Insect	Castile-La Mancha	Research into the properties of the mealworm to extract a sustainable alternative protein for human and animal consumption.
YSOTOPE Theranostics	Community of Madrid	Design of new radio-tracers to monitor CAR-T cells.
Zelula Biopharma	Basque Country	Development of novel immunotherapies (CAR-T) to fight solid tumours.





BIOSPAIN 2023 in Barcelona: not to be missed

BIOSPAIN is the benchmark international event for Spanish biotechnology.

AseBio is organising this edition of the event with collaboration from the Government of Catalonia, Barcelona City Council and Biocat. It will take place **from 26 to 28 September in Barcelona**.

BIOSPAIN is celebrating its **20th anniversary** and its consolidation as the international showcase of the potential in the Spanish sector, thanks to its proven capacity to generate business and investment opportunities for participating companies.

BIOSPAIN 2023 will feature the Partnering INOVA™ system, a trade fair, several networking

events and a full programme of sessions. The programme will deal with current topics such as: Advanced therapies, precision medicine, vaccines, gene and cell therapy, rare diseases, personalised medicine, biomanufacturing, strategic autonomy, food of the future, the energy transition, funding, public procurement, talent in the biotech sector and much more.

BIOSPAIN 2023 expects to bring together 1,700 professionals from 30 countries around the world in Barcelona, opening up business opportunities with more than 3,500 one-to-one meetings, 50 investors from Spain and abroad, and 200 exhibitors.



ENVIRONMENTAL CONDITIONS

2022 AseBio Report

05

5.1 HOW SOCIETY SEES OUR WORK

SPANISH SOCIETY INCREASINGLY VALUES SCIENCE AND TECHNOLOGY

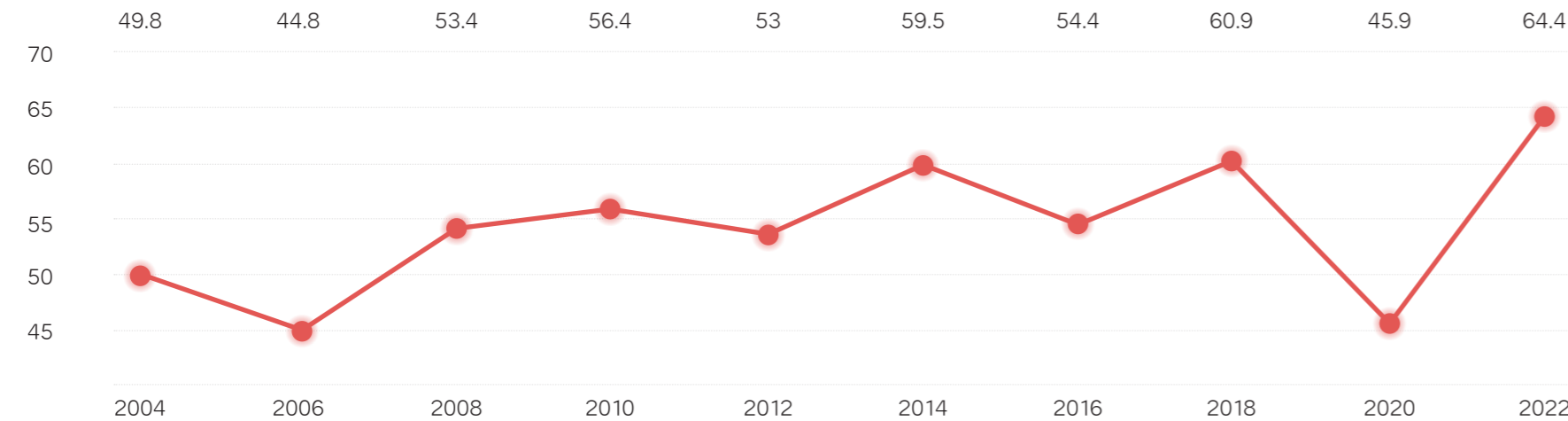
Every two years, the Spanish Foundation for Science and Technology (FECYT) conducts its Social Perception of Science and Technology in Spain survey. The results of the 2022 study show a substantial improvement in the relationship between science and society over the past two decades.

People's image of science has improved steadily over the past twenty years. In the latest survey, from 2022, nearly 65% of those asked

said science and technology have more benefits than drawbacks, compared to 50% in 2004. If we look at the evolution in recent years, we can see that the situation improved notably between 2020 and 2022, up 40% (Graph 5.1).

This sustained improvement in public perception of science and technology since 2020 is due to the role diagnostic solutions and vaccines played in bringing an end to the pandemic.

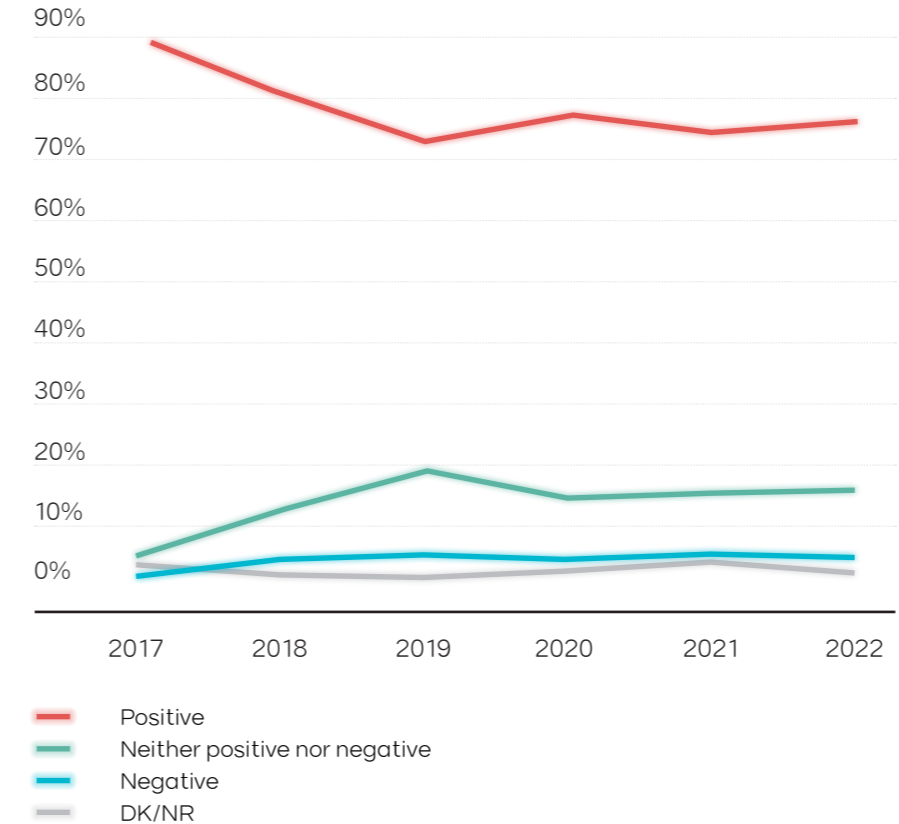
This positive trend can be seen in the fact that 82.9% of the population said vaccines are necessary to keep people healthy in 2022, up 3.6% from 2020.



GRAPH 5.1. Evolution of perception of Science and Technology. 2004-2022. Source: FECYT.

POSITIVE PERCEPTION OF INNOVATION REMAINS STABLE

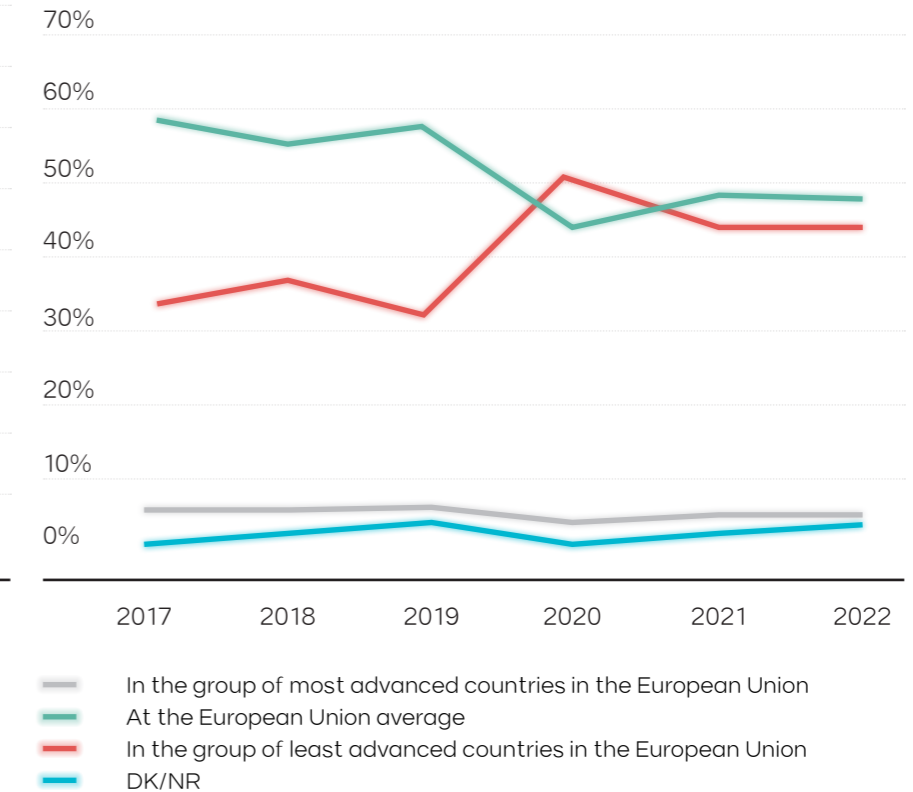
The survey on Social Perception of Innovation in Spanish society COTEC conducted in May 2023 showed that 76.2% of those surveyed consider innovation a positive thing. This is up slightly from 2021 and slightly higher than pre-pandemic results, which showed a 73% approval rate (graph 5.2).



GRAPH 5.2. Evolution of public opinion of innovation 2017-2022. Source: COTEC.

PERCEPTION OF SPANISH INNOVATION COMPARED TO EUROPE REMAINED STABLE

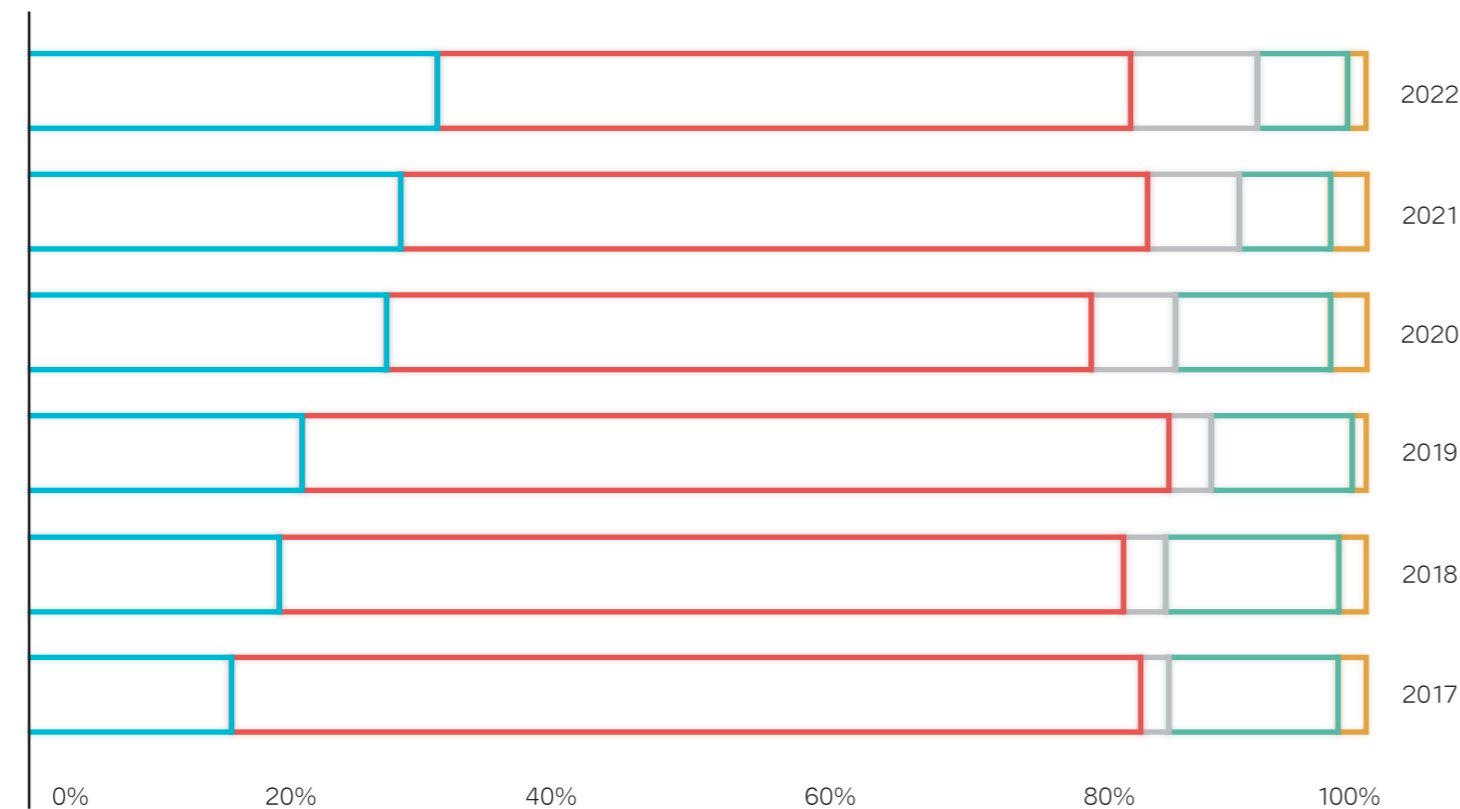
In 2022, 47% of Spaniards put innovation from our country at the EU average, down slightly from 48% in 2021. On the other hand, while 45% of those surveyed in 2021 put innovation from Spain among the least advanced countries in the EU, in 2022 this percentage dropped to 44%. This confirms the improvement in social perception of innovation in our country compared to those around us (Graph 5.3).



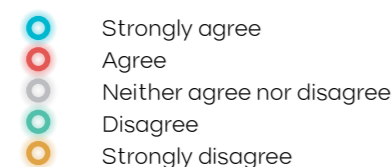
GRAPH 5.3. Evolution of opinion of Spanish innovation compared to European Union 2017-2022. Source: COTEC.

SOCIAL PERCEPTION THAT PUBLIC INVESTMENT IN INNOVATION IS NOT SUFFICIENT CONTINUES TO GROW

While 29% of those surveyed in 2021 highly agreed with the statement that public investment in R&D is insufficient, that figure rose to 32% in 2022.



GRAPH 5.4.
Evolution of public opinion of deficiency of public R&D investment 2017-2022. Source: COTEC.

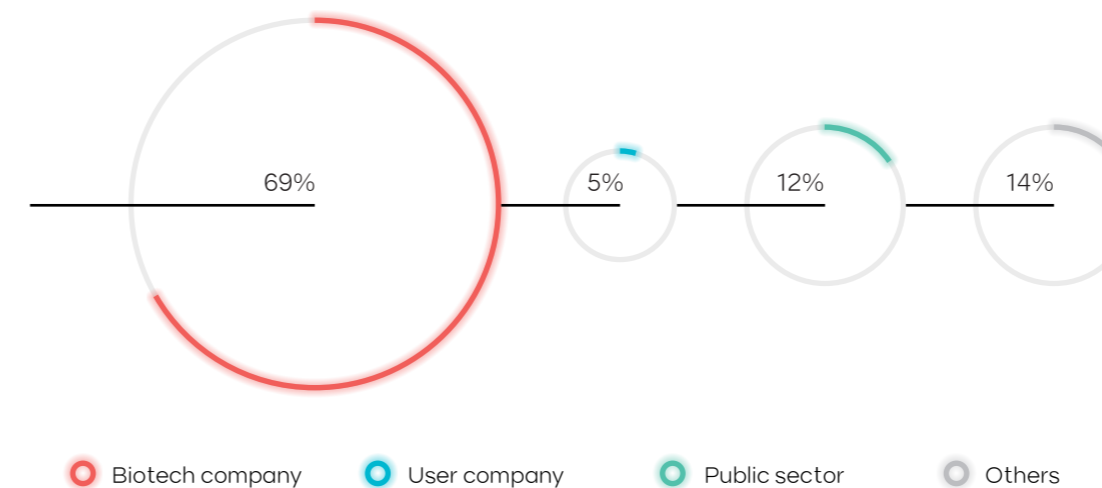


5.2 HOW THE BIOTECHNOLOGY SECTOR SEES ITS WORK ENVIRONMENT

This section looks at how AseBio members perceive the evolution of the biotechnology sector based on their opinions on a series of factors.

This year's survey had 73 participants, 69% were biotechnology companies, followed by organisations in the public sphere (12%), companies that use biotechnology (5%) and finally other sorts of organisations (14%), such as private capital fund managers and private research centres and institutes.

Table 5.1 shows the results of the survey rating 21 factors. A rating of 1 or 2 is very negative or negative and a 3 or 4 is positive or very positive.



GRAPH 5.5.
Breakdown of participants in the Perception of environment survey by type of organisation. Source: AseBio. 2022.

HIGHEST RATED FACTOR IS PUBLIC OPINION OF BIOTECHNOLOGY

In 2020, the most highly rated factor was, for the first time, the public opinion of biotechnology, as a result of the Covid-19 pandemic, and it has remained at the top ever since.

As table 5.1 shows, the factors with over 2.5 are rated positively. In addition to public perception of biotechnology, the most highly rated factors include training level of workers, qualified personnel, creation of national companies, number of bioentrepreneurs, and cooperation with universities, IPOs and technology centres. On the other hand, the lowest rated factors include the economic situation, cost of innovation, support from the public administration, regulatory framework and time to profitability.

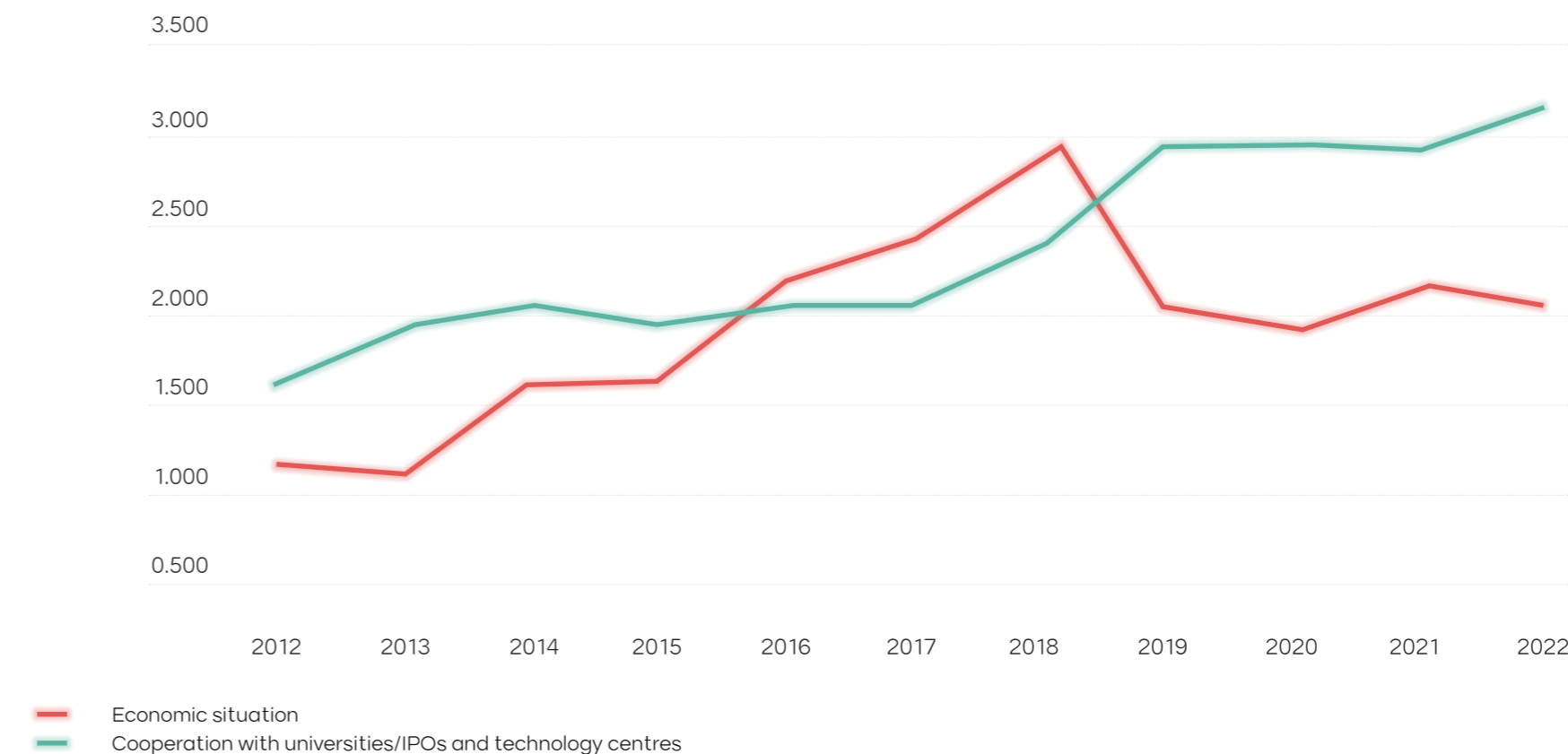
TABLE 5.1.
Rating for factors,
average and % change.
Source: AseBio. 2022.

Factors	2022	2021	Average 2000-2022	% Variation 2021-2022
Public opinion of biotechnology	3.342	3.533	2.288	-5%
Employee training level	3.274	3.204	3.857	2%
Qualified personnel	3.219	3.173	2.150	1%
Creation of new companies in Spain	3.211	3.106	2.779	3%
Number of bioentrepreneurs	3.200	3.192	2.317	0%
Cooperation with universities/IPOs and technology centres	3.194	3.048	2.254	5%
Internationalisation process	3.075	3.088	1.442	0%
Demand for more sophisticated products with higher value added	3.071	3.196	3.298	-4%
Specialised facilities (technology centres, auxiliary services centres, etc.)	3.057	3.010	2.211	2%
Specialised suppliers (consultants, lawyers, etc.)	3.029	3.010	2.227	1%
Increase in the average size of biotechnology companies	3.014	3.099	2.709	-3%
Mergers/acquisitions/strategic partnerships	2.941	3.060	2.874	-4%
Attracting international companies	2.941	2.808	2.769	5%
Information on the biotechnology market	2.833	3.048	2.277	-7%
Market-orientated nature of the public technology offering	2.714	2.871	2.368	-5%
Access to funding	2.479	2.549	1.222	-3%
Time to profitability	2.379	2.375	2.190	0%
Regulatory framework	2.343	2.376	0.552	-1%
Support from Public administration	2.329	2.356	0.955	-1%
Cost of innovation	2.290	2.330	2.190	-2%
Economic situation	2.042	2.176	2.213	-6%

SECTOR'S VIEW OF ECONOMIC SITUATION WORSENS, BUT COOPERATION WITH PUBLIC ENTITIES IMPROVES

Graph 5.6 shows the evolution of the factors that saw the biggest change from the previous year. The marks for the economic situation once again dropped, remaining the worst rated factor for development of biotechnology companies.

The factor with the next biggest change is cooperation with universities, public research bodies and technology centres, which again rose 5% from 2021. This factor has seen a cumulative increase of 95% since 2012.



GRAPH 5.6. Evolution of the factors. Economic situation and Cooperation with universities/IPOs and technology centres. 2012-2022. Source: AseBio.



Bioeconomy: Biotechnology as a key element of innovation

The bioeconomy is Europe's response to the key environmental, societal and economic challenges the world is facing today. The bioeconomy is focused on reducing dependency on limited fossil-based resources and ensuring healthy and secure food production and supply, as well as positioning these biology-based products within a new more sustainable, resilient growth model.

These products are a real alternative for Europe to address emergencies like the energy and food crises. Spain was one of the first countries in Europe to develop a Strategy on Bioeconomy, and to launch, through its autonomous communities, specific action plans.

One of the most noteworthy aspects of biotechnology is its ability to drive innovation. Thanks to innovation and development in this area, significant advances have been achieved in creating new biotechnology products and processes, such as cleaner renewable biofuels, through fermentation and biodegradation, as well as bioplastics and biocomposites.

Companies in the sector that work in the bioeconomy aim to drive innovation in this area and align policies among all countries in Europe. The bioeconomy plays a key role in addressing social challenges like food safety, climate change and the availability of clean, affordable power, and in speeding up our progress towards the United Nation's Sustainable Development Goals (SDG).

In short, biotechnology has proven to be a driver of change in the Spanish and European bioeconomy. Its applications are driving innovation, boosting efficiency and promoting sustainability. The disruptive nature of biotechnology makes it a discipline with even greater potential to tackle current and future challenges, and to drive economic growth in harmony with the environment. It is crucial to promote investment and collaboration between the public and private sectors to ensure continued, successful development of biotechnology in the bioeconomy.

ASEBIO AND SHAPINGBIO

The ShapingBio project seeks to promote innovation in the European bioeconomy across sectoral, governmental and geographical levels by providing evidence-based information and recommendations for better policy alignment as well as supporting and integrating stakeholders in the bio-based sectors. The consortium has 10 partners from 9 countries (Germany, Spain, Belgium, Ireland, Czech Republic, Italy, Bulgaria, France and Denmark).

The actions **will take place over three years** and kicked off in September 2022, **recommending measures and best practices to strengthen this innovation ecosystem and boost sustainability and resilience to address food and energy challenges in Europe.** This project seeks to boost the impact of the bioeconomy based on the goals in the Farm to Fork strategy, the political priorities of the European Union's Green Deal and the EU climate commitment for 2030 and 2050.

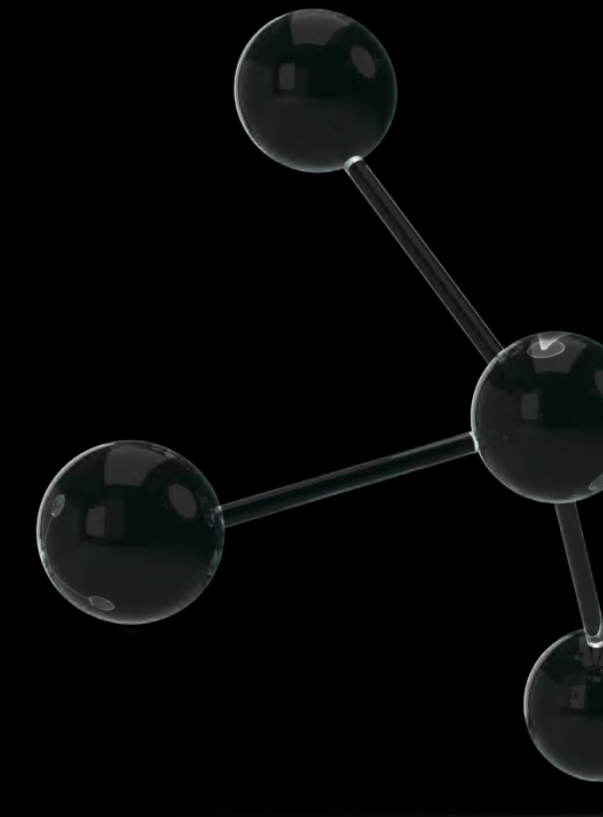
AseBio, as a member of the consortium, takes an active role in all the work packages in the project and is leading the one on Implementation and testing, and the final event. Both will involve networking and matchmaking events to promote dialogue and collaboration among the stakeholders and the sectors of the bioeconomy and food systems.

At AseBio, we continue working to drive transformation towards a circular bioeconomy and more sustainable food systems, in which biotechnology plays a key, disruptive role.

Criss Monzón,
Head of Projects AseBio



This project has received funding from the European Union's Horizon Europe Programme under Grant Agreement number: 101060252



RESULTS

2022 AseBio Report

06

In this section, we sum up the main indicators of results in the biotechnology sector, in terms of knowledge generation (production and quality of scientific publications), technological innovation (patents), companies' research advances (advances in studies, regulatory authorisations or expanded capacities), products and services launched to market, and finally, licensing deals.

6.1 PRODUCTION OF SCIENTIFIC KNOWLEDGE

SPANISH BIOTECHNOLOGY MAKES UP 2.6% OF GLOBAL PRODUCTION IN THIS AREA AND IS CITED 20% MORE THAN THE GLOBAL AVERAGE

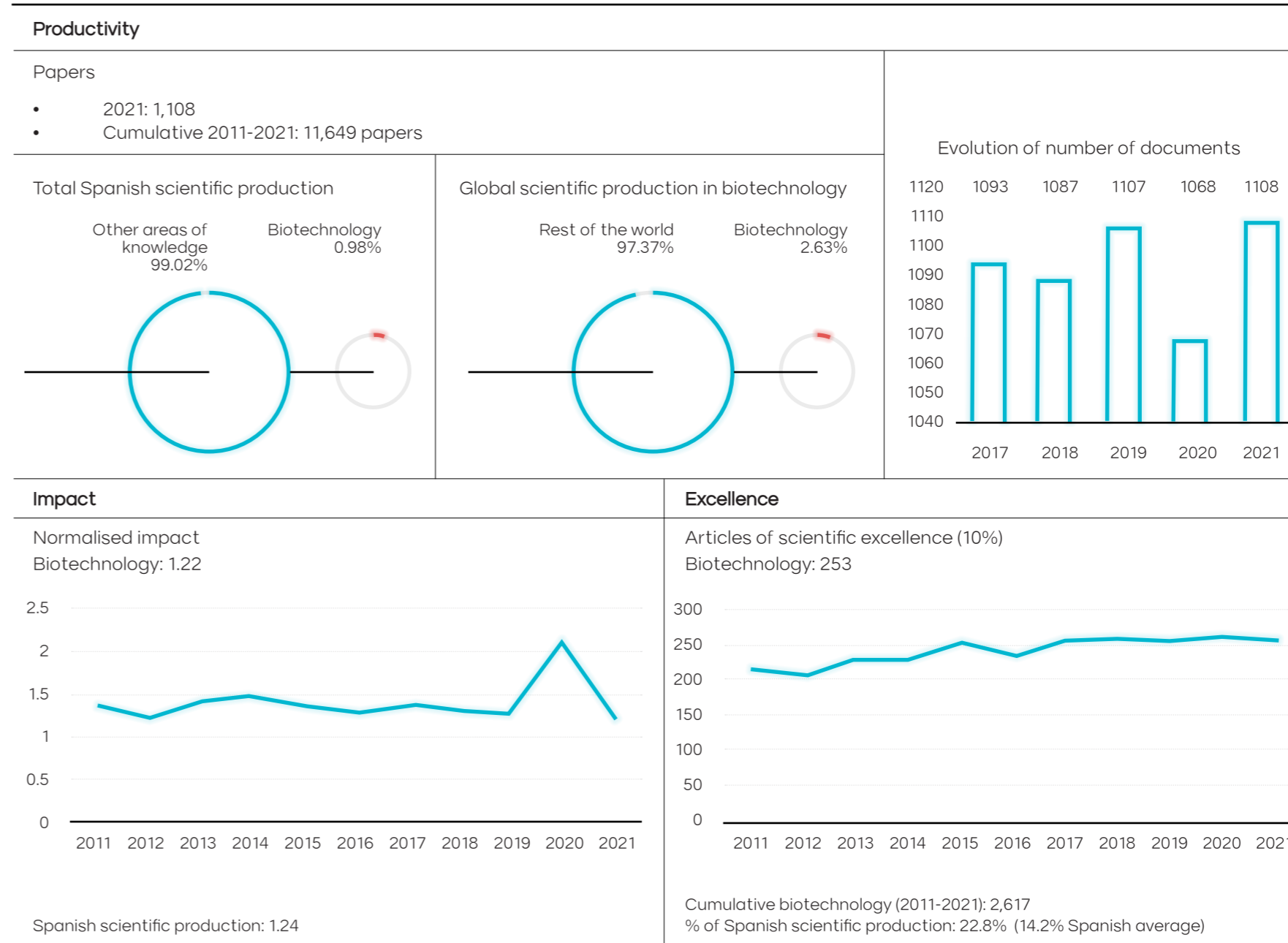
In 2021, scientific production in biotechnology made up 1% of all scientific production in Spain, with 1,108 papers, and 2.6% of global scientific production in this area (graph 6.1).

The normalised impact of biotechnology scientific production in Spain was 1.2 in 2021, which means it is cited 20% more than the global average in this area.

The quality of research in biotechnology can be judged by observing the number of documents published in high-impact journals. In 2021, of the 1,108 scientific papers produced by Spanish institutions in biotechnology, 717 were published in journals ranked in the first quartile (Q1) by impact factor, or 65.6%, which is 6% higher than the Spanish average.

Another way to measure the quality of research in biotechnology is to look at the number of excellent publications, those among the top 10% most cited in the world in this area. Spain produced 253 documents of excellence in biotechnology in 2021, 22.8% of all papers published in this area. This percentage of excellence in biotechnology is well above the Spanish average for excellence (14.2%).

The impact indicators spiked in 2020, probably due to the Covid-19 healthcare crisis, and returned to pre-pandemic levels in 2021.



GRAPH 6.1. Bibliometric overview of Spanish research in biotechnology, 2011-2021. Source: FECYT, from data using the SciVal-SCOPUS tool in April 2023.

SPAIN RETURNS TO NINTH ON THE GLOBAL RANKING BY NUMBER OF PAPERS IN BIOTECHNOLOGY

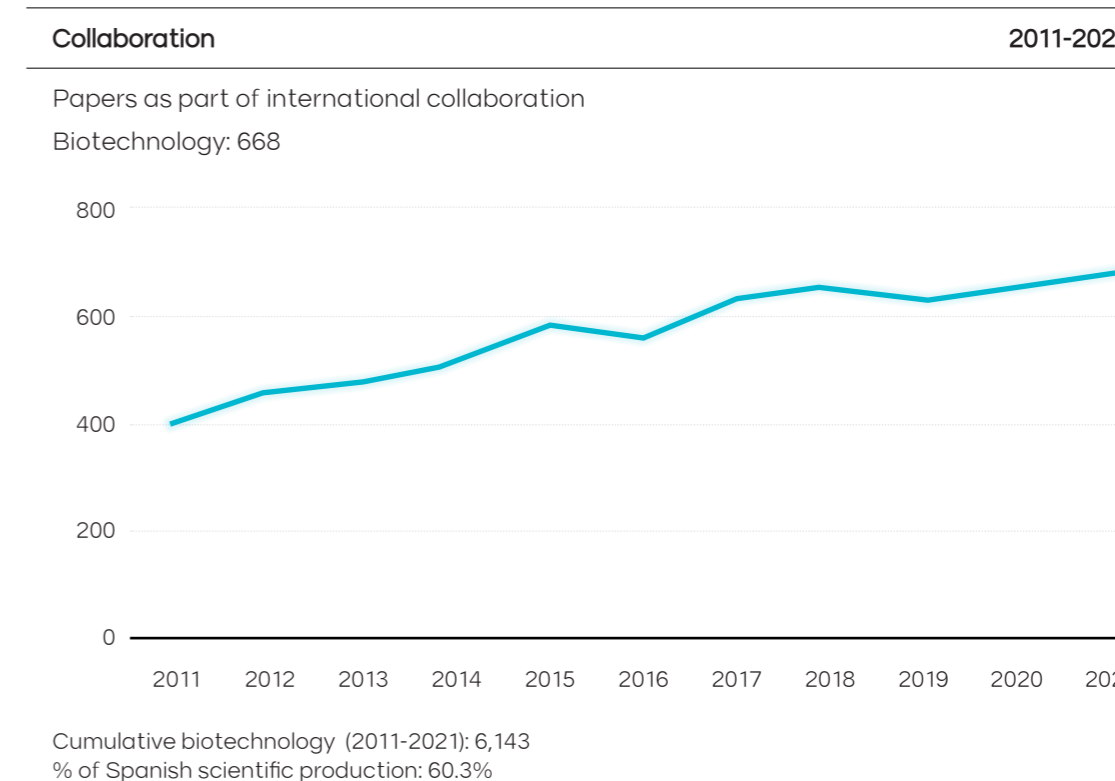
TABLE 6.1. Top 10 countries in scientific production in biotechnology. 2011-2021. Source: FECYT.

Spain returned to ninth on the global ranking by number of papers in biotechnology. China and the United States have the highest production in terms of number of documents in this area. However, the proportion of scientific production in biotechnology to general scientific production is the highest in India and South Korea. In terms of quality, the United States and United Kingdom stand out with the highest indicators of research quality, in terms of publications in high-impact journals, publications of excellence and normalised impact.

Ranking	Country	No. of documents	No. of documents in biotechnology	Scientific production in biotechnology as a percentage of total scientific production (%)	Normalised impact of biotechnology	Scientific production in high-impact journals (Q1) (%)	Scientific production in biotechnology of excellence (%)	Scientific production in biotechnology as part of international collaboration (%)
1	China	6,086,613	90,113	1.48%	1.22	49.6%	21.1%	23.8%
2	United States	6,457,390	68,782	1.07%	1.54	67.7%	24.2%	43.0%
3	India	1,607,481	36,612	2.28%	0.70	18.5%	10.7%	14.8%
4	Germany	1,789,594	21,813	1.22%	1.40	63.0%	21.2%	52.0%
5	South Korea	886,051	21,248	2.40%	0.96	37.7%	14.4%	25.6%
6	Japan	1,399,986	20,719	1.48%	0.84	36.5%	9.5%	30.0%
7	United Kingdom	1,911,881	17,538	0.92%	1.53	67.3%	24.3%	64.7%
8	Italy	1,160,614	11,759	1.01%	1.37	54.4%	21.6%	48.0%
9	Spain	968,813	11,649	1.20%	1.40	62.1%	22.5%	52.7%
10	France	1,212,453	11,202	0.92%	1.43	65.2%	21.0%	62.5%

60% OF SCIENTIFIC PRODUCTION IN BIOTECHNOLOGY IS DONE AS PART OF AN INTERNATIONAL COLLABORATION

International collaboration in Spanish scientific production in biotechnology has grown steadily in recent years. The percentage of documents on biotechnology authored by Spanish and foreign institutions made up 60.3% of the total in 2021, with 668 documents. For every year in the period studied, the percentage of Spanish scientific production in biotechnology published as an international collaboration is above the Spanish average, which is 49.4%.



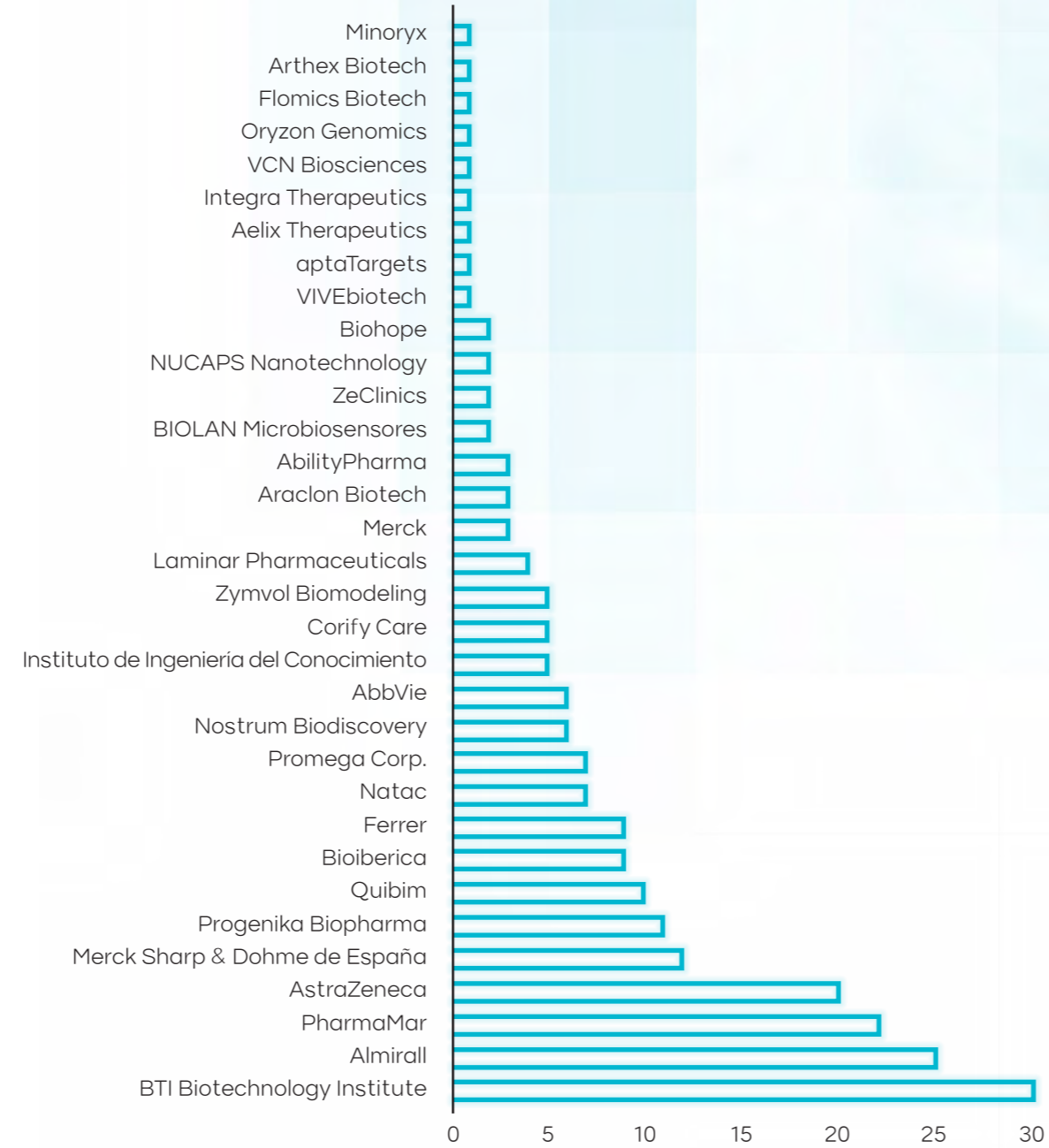
GRAPH 6.2. Papers as part of collaboration. Source: FECYT.

ASEBIO MEMBERS PUBLISH 230 PAPERS IN BIOTECHNOLOGY

Every year, AseBio surveys its members, both Spanish companies and multinational corporations with offices in Spain, on their publications in high-impact science journals.

In 2022, these companies published 230 papers, which was 74 fewer than in 2021, down 24%. Among the companies with the most publications (graph 6.3), we find BTI Biotechnology Institute first with 30, followed by Almirall with 25, PharmaMar with 22, AstraZeneca with 20, MSD with 12 and Progenika with 11.

Additionally, although not included in this ranking, it is worth noting publications by AseBio members such as CIBER with 7,221, Health Research Institute Hospital La Fe with 1,635, IRB Barcelona with 182, Vicomtech Foundation with 12, Spanish Bank of Algae with 11, Spanish Society of Medical Oncology with 7, Ainia with 4 and Fundación de Investigación Biomédica del Hospital Universitario de la Princesa with 1.



GRAPH 6.3. Number of science papers published in 2022 by AseBio member companies. Source: AseBio.

6.2 TECHNOLOGICAL INNOVATION

BIOTECHNOLOGY SECTOR PATENTS IN EUROPE AND INTERNATIONALLY

There were 544 patent applications and 99 patents granted in Spain in 2022. Patents with a Spanish priority claim or stakeholder in the biotechnology sector were identified through the various patent offices (OEPM, EPO, USPTO, JPO and WIPO).

The sector continues to choose to protect its innovation mainly through the European Patent Office (EPO) and with international PCT patents (table 6.2), which has been the trend since 2013.

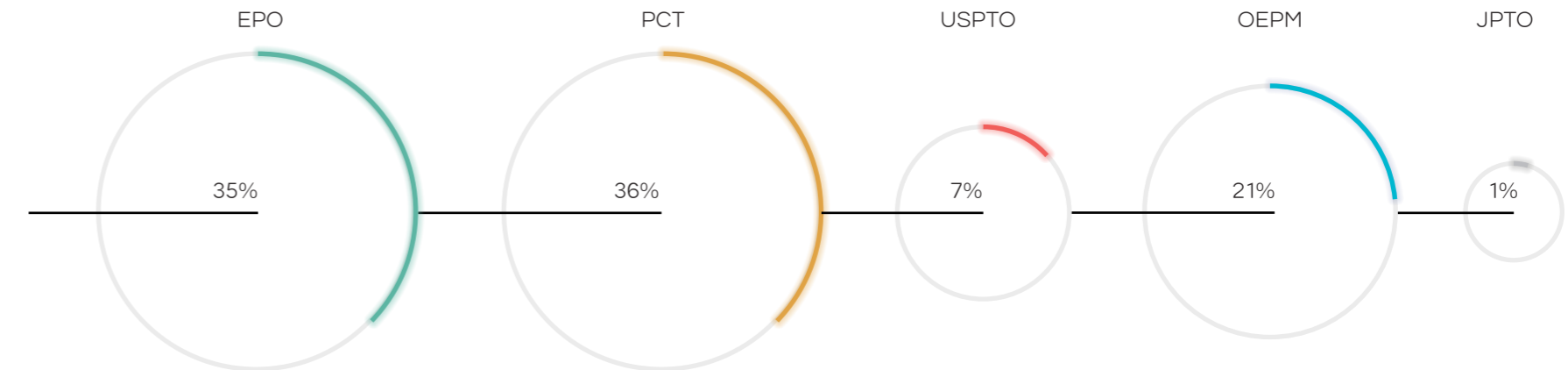
COLLABORATIONS:



Patents issued	OEPM	EPO	USPTO	JPTO	PCT	TOTAL
Applications	114	190	38	6	196	544
Granted	52	32	13	2	N/A	99
TOTAL	166	222	51	8	196	643

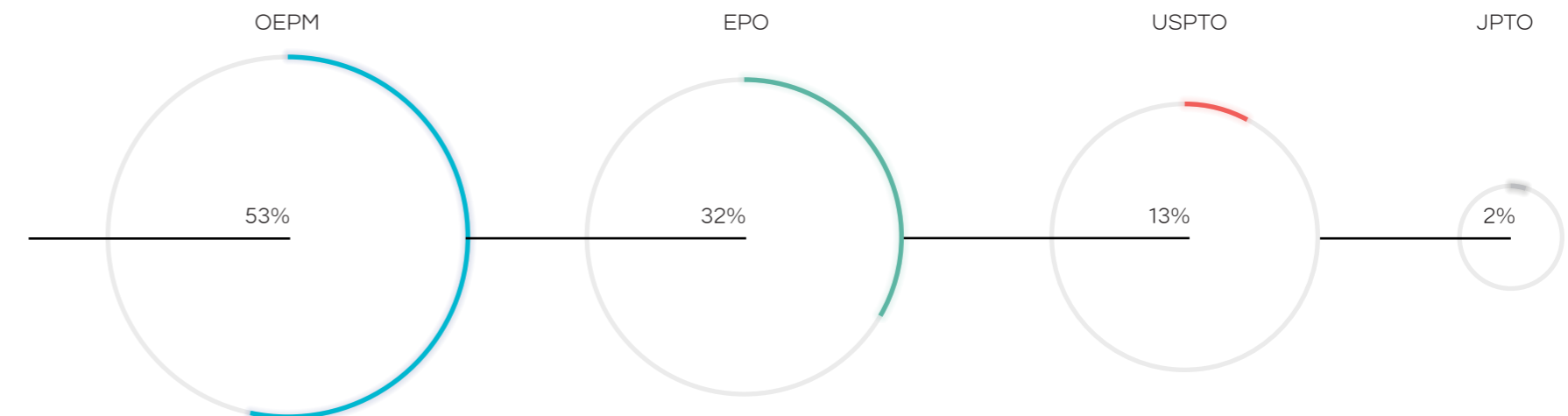
The majority of the sector has chosen to protect innovations on a European level, with 222 patents, and 196 through PCT, while only 166 patents were issued through the Spanish Patent and Trademark Office, fewer than the previous year.

Graph 6.4 shows that the highest percentage of patent applications in the biotechnology sector were filed through international PCT patents, 36% of the total. These were followed by patent applications with the European Patent Office (35%), the Spanish Patent and Trademark Office (21%), the United States Patent and Trademark Office (7%) and the Japan Patent Office (1%).



GRAPH 6.4. Biotechnology patent applications. (2022). Source: ClarkeModet -FPCM.

The patents granted (graph 6.5) follow the same trend as the previous year. 53% of patents were issued by the Spanish Patent and Trademark Office, 32% by the European Patent Office, 13% by the United States Patent and Trademark Office, and 2% by the Japan Patent Office.



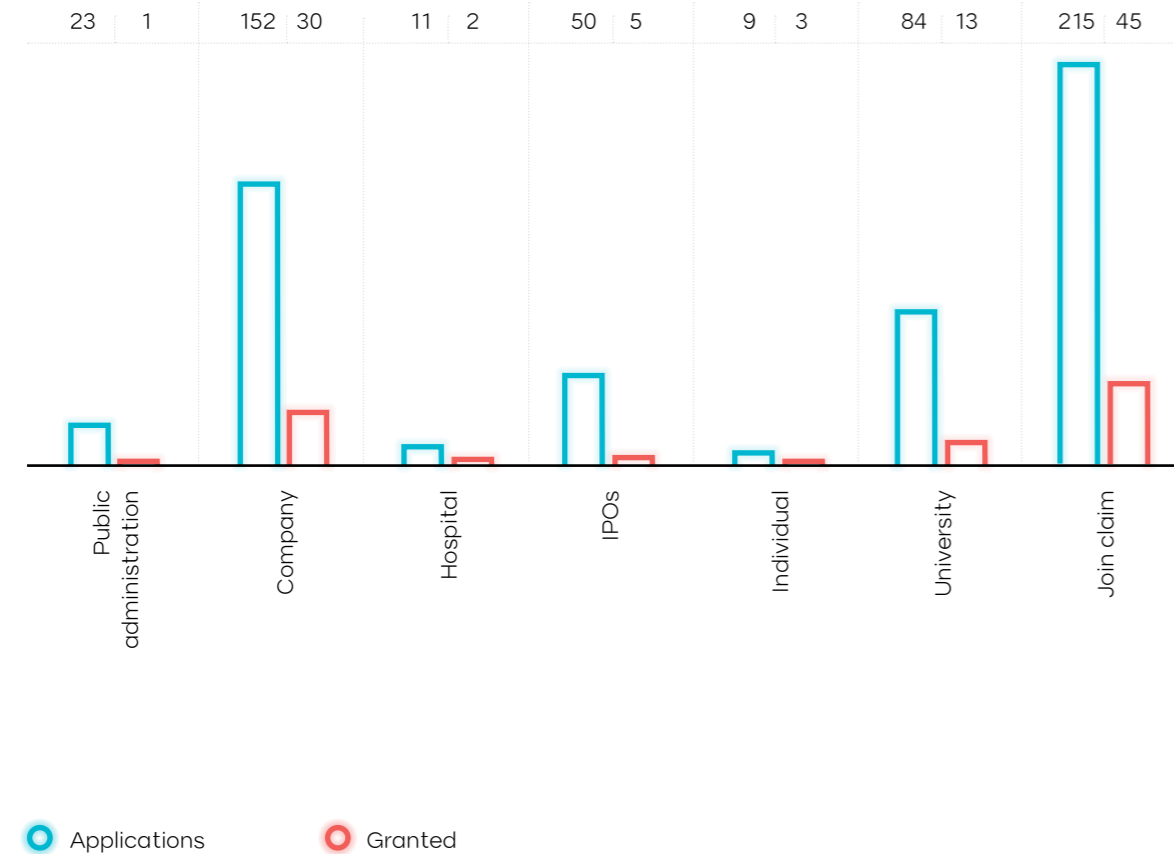
GRAPH 6.5. Biotechnology patents issued 2022. Source: ClarkeModet - FPCM.

TABLE 6.2. Number of patent applications and patents granted to Spanish biotechnology organisations (2022). Source: ClarkeModet - FPCM.

JOINT CLAIMS REMAIN THE MAIN PATHWAY TO PATENTS

As we can see in graph 6.6, collaborative patenting through joint applications remains the most common pathway in the biotechnology sector, with 215 applications and 45 patents granted. This is followed by patents held by a single company, with 152 applications and 30 patents granted, and at a greater distance universities, with 84 applications and 13 patents granted.

GRAPH 6.6. Holder of patent applications and patents granted (2022). Source: ClarkeModet – FPCM.



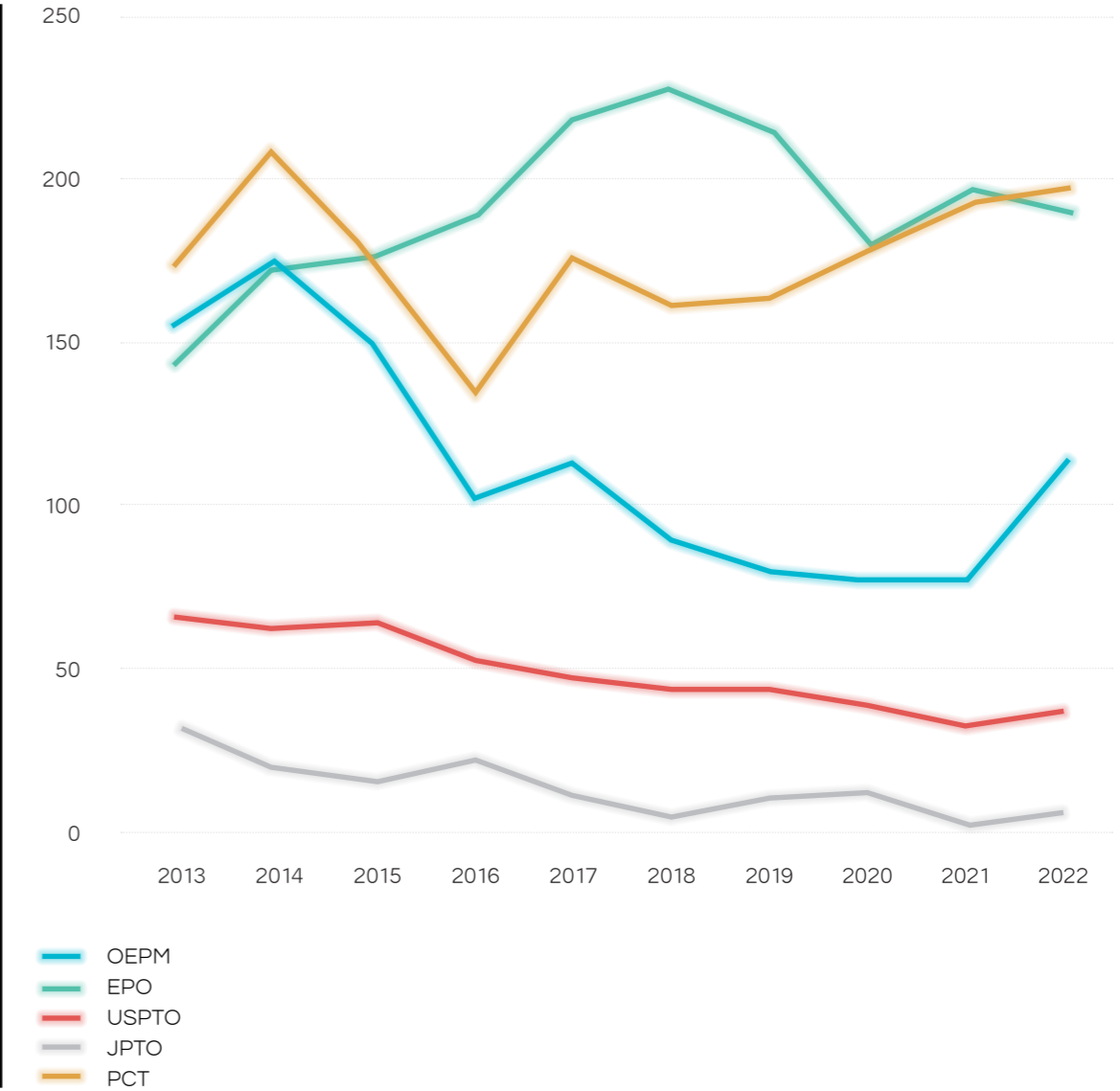
EUROPEAN AND INTERNATIONAL PATENTS CONTINUE TO INCREASE PROGRESSIVELY

As graph 6.7 on the evolution of patent applications since 2013 shows, the sector continues to focus on patenting in international and European arenas.

The number of PCT and European Patent Office applications has grown steadily since 2020, and in 2022 made up over 70% of all patent applications.

More noteworthy, however, is the considerable increase in applications submitted to the Spanish Patent and Trademark Office, returning to levels last seen in 2017.

In turn, US and Japanese patent applications rose slightly compared to the previous year.



GRAPH 6.7. Trend of patent applications (2013-2022). Source: ClarkeModet – FPCM.

6.3 ADVANCES IN DEVELOPMENT

BIOHEALTH

ADVANCES IN STUDIES:

Ability Pharmaceuticals began its trial on ABTL0812 in combination with FOLFIRINOX in 150 patients with advanced pancreatic cancer as a first-line treatment at the University of Cincinnati Medical Centre in the US and Vall d'Hebron Institute of Oncology (VHIO) in Barcelona.

Almirall began the experimental portion of its phase III clinical trial (ADvantage) on lebrikizumab in patients with moderate to serious atopic dermatitis (AD) that have not responded to treatment with Cyclosporine oral.

aptaTargets began its APTACOVID trial to treat hospitalised patients prone to developing uncontrolled inflammatory processes with ApTOLL. In addition to completing recruitment of 119 patients, they got preliminary results from the phase IIa clinical trial APRIL on ApTOLL as a neuroprotective drug that reduces brain damage in patients that have experienced an acute ischaemic stroke.

Arthex Biotech announced that the US FDA granted orphan drug designation to ATX-01 to

treat myotonic dystrophy type 1 (DM1).

Atrys announced its participation in the DIP-CAN Project, which seeks to change how metastatic cancer is treated in Spain by integrating clinical, genomic, pathological anatomy and imaging data for 2,000 patients.

Biohope launched to market, thanks to its partnership with Palex, its Immunobiogram® in vitro test, which helps select the most suitable therapy for each kidney-transplant patient from a blood sample.

BIOLAN HEALTH began selling its rapid antigen test for self-diagnosis of Covid-19 in chemists after being granted the much-anticipated authorisation.

BIOLAN, also has the BIOLANglobal platform, a digital service accessible from any device with an internet connection that allows users to view and download results of analyses, monitor the management process, track analysis for all their plants and set up alerts. All of this helps improve the user's analysis experience and provide more personalised, accurate service.

Biosfer Teslab presented the first results from the VISIONING project that is developing and implementing the first in vitro prognostic test for patients with Covid-19, in order to triage infected patients based on risk. This test is based on a combination of metabolomics via nuclear magnetic resonance (NMR) and artificial intelligence algorithms, which showed that more than 40% of patients have diabetes and/or dyslipidemia.

Plus, they launched Test MetBalance, an in-

novative blood test that combines advanced molecular profiling based on cutting-edge technology, NMR metabolic analysis and artificial intelligence.

Highlight Therapeutics announced results from its phase IIb study on BO-112 with pembrolizumab in patients with anti-PD1 progressive melanoma.

NFX88 from **Neurofix**, a drug developed for neuropathic pain in patients with spinal injuries, successfully completed clinical phase IIa.

ORYZON presented final data from its phase IIa ALICE trial on iadademstat in patients with acute myeloid leukaemia (AML), proving clinical efficacy.

Peaches Biotech, published positive in vivo results for its drug PRS CK STORM to fight cytokine storms associated with infectious processes.

Peptomyc announced it has completed phase I of the clinical trial on Omomyc (OMO-103), an inhibitor of MYC, a protein involved in the initiation and maintenance of cancer.

PharmaMar announced the beginning of a new phase I clinical trial on PM534, a novel anti-tumour compound of marine origin that has come out of the company's research programme to treat solid tumours. The company also announced it is leading a new research project in collaboration with CIMA University of Navarra and the Autonomous University of Madrid to find new marine compounds with anti-tumour activity that act via innovative immunomodulation mechanisms. They also launched another

project, ONCOLIBERYX, with the University of Santiago de Compostela, University of Navarra, University of the Basque Country and CIMA University of Navarra, to develop new strategies to administer marine-origin oncology drugs.

Sylentis, a subsidiary of PharmaMar, announced it has started and recruited the first patient in the United States for a new phase III trial to assess the long-term safety of tivanisiran to treat the signs and symptoms of dry eye disease. Plus, the company announced it has completed the first phase I study on its compound SYL1801 to treat and prevent choroidal neovascularisation and announced the start of a new phase II trial on this compound in patients with age-related macular degeneration.

Tigenix (Takeda) announced positive results from its INSPIRE study on Alofisel® (darvadstrocel) for patients with complex perianal fistulas associated with Crohn's disease.

Vitro began phase II of the ASURANT project (Analysis of Microbial Susceptibility and Resistance to Antibiotics) at the Virgen de Rocio and Reina Sofía university hospitals to validate a system that simultaneously identifies bacteria and resistances to a large panel of antibiotics. Plus, the company announced it has validated its MDR Direct Flow Chip kit at Virgen del Rocio Hospital in Seville to quickly detect microorganisms and antibiotics-resistance mechanisms.

VIVEbiotech announced it has received GMP certification to manufacture lentiviral vectors, expanding its scope so it can now manufacture lentivirus for in vivo and ex vivo use.

REGULATORY AUTHORISATIONS:

AEMPS granted **Algenex** GMP certification to manufacture active pharmaceutical substances in the European Union.

Araclon Biotech obtained CE marking for its two early diagnostic tests for Alzheimer: ABtest-MS and ABtest-IA.

DR Healthcare active ingredient diamine oxidase (DAO) obtained GRAS (Generally Recognised As Safe) designation under the US Federal Food, Drug, and Cosmetic Act.

The **Grifols** Procleix Plasmodium trial for malaria screening of blood received CE marking. The test uses a total blood sample and detects the ribosomal RNA (rRNA) present in thousands of copies of each parasite. Plus, the company received European approval to commercialise XEMBIFY® to treat primary immunodeficiencies and some secondary immunodeficiencies.

IMERETI received AEMPS authorisation as a pharmaceutical manufacturing lab of biological drugs for human use to produce platelet-rich plasma.

The FDA granted **Laminar Pharma** Fast-Track designation, which facilitates development and accelerates drug review, for the research of the drug LAM561 to treat patients with glioblastoma. **Life Length** got its Operating Licence from AEMPS, and CE marking for its test to diagnose prostate cancer: PROSTAV®.

ORYZON announced FDA approval of orphan drug designation for small-cell lung cancer treatment with iadademstat. It also announced FDA approval of IND for FRIDA, a phase Ib clinical trial on iadademstat in R/R AML FLT3mut+ patients. Plus, the Medicines and Medical Devices Agency of Serbia granted authorisation for a phase IIb clinical trial on vafidemstat in patients with borderline personality disorder in Serbia.

PharmaMar's Zepzelca® (lurbinectedin) was granted innovative drug designation by the MHRA - UK Medicines and Healthcare products Regulatory Agency and orphan drug designation to treat malignant mesothelioma from the Swiss Agency for Therapeutic Products (Swissmedic). It also announced that its partner in China, Luye Pharma Group Ltd., obtained approval from healthcare authorities to use lurbinectedin for compassionate care in patients with small cell lung cancer in the province of Hainan, China.

Vitro announced it has put its first products on the market after European Regulation 2017/746 went into effect regulating in vitro healthcare products (IVDR).

EXPANDED CAPACITIES:

Grifols inaugurated a new production plant in Ireland that triples its yearly capacity to produce albumin.

Histocell inaugurated a new cell and biological drug manufacturing plant, increasing its production capacity tenfold. The company invested €2.5 million in the project, with support from Histocell's partner Cardiva.

Merck invested €14.5 million in its site in Mollet del Vallès (Barcelona), specifically the Electronics plant, to meet increased demand from the life sciences sector for THAM® and TITRI-PLEX®, both pharmaceutical excipients used in increasingly diverse biotechnology solutions, such as Covid-19 vaccines.

Specipig opened a new neonatal intensive care unit at its facilities in the Barcelona area, as well as expanding its facilities to a total 2,400 square metres, in order to boost its capacity as a Contract Research Organisation.

Sylentis inaugurated the first plant in Spain and third in Europe manufacturing oligonucleotides to GMP standards.

AGRIFOOD

AINIA, under the framework of the MICROBIO-SA-FE project, developed novel experimental ingredients with more selective antimicrobial activity that don't build up resistance to common pathogens in the food supply chain. The company also kicked off its LIFE REPTES project to help find alternatives to burning rice straw in the Albufera Natural Park (Valencia) by developing a new circular model that produces green biofuel from rice-growing byproducts and sewage sludge.

Algenex announced its expansion into the food technology market with its CrisBio® production platform, which can supply essential food ingredients, part of what is known as "growth media" to produce cultured meat for less and with greater scalability than any other technology.

Best Medical Diet got certified to FSSC 22000 standard, which is a complete certification for food-safety management systems recognised by the GFSI.

AOAC International has made the BIOMILK 3000 LACTOSA lactose-measuring method from **BIOLAN** official method 2020.09 in its OMA programme: Official Methods of Analysis.

BIOLAN HEALTH, in collaboration with Hospital Quirón Salud Bizkaia, launched a new test to diagnose lactose intolerance in Euskadi.

Biorizon Biotech, launched Biobalance, a new solution that helps improve nutrient absorption, with biostimulant effects for the plant and protection for the root against fungi and bacteria that attack before, during and after harvest.

Mikrobiomik started its phase III clinical trial in over 20 Spanish hospitals, with the aim of becoming the first company in the world to commercialise the first biological drug based on gut microbiota, for the indication of recurring *Clostridioides difficile*

Ingulados obtained a new invention for the *Mycobacterium chelonae* strain of bacteria to develop and market pharmaceutical and/or food products to control and prevent tuberculosis, which affects a wide variety of animal species and humans.

Natac opened new offices in Singapore to serve its clients in the area.

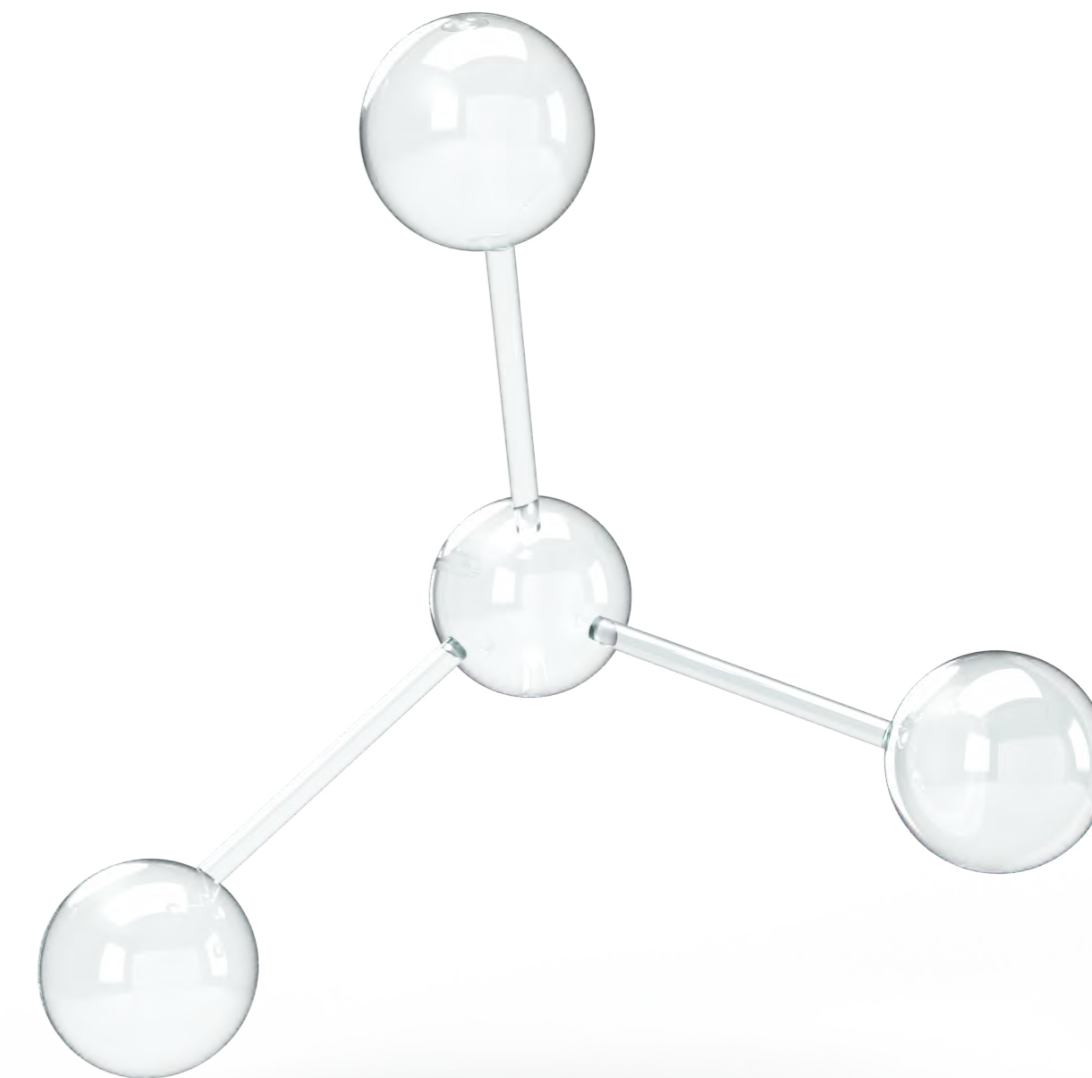
Reig Jofre, completed co-development of TRI-FERTY-ATM®, in collaboration with Centro de

Infertilidad Masculina y Análisis in Barcelona, a food supplement that helps promote male fertility.

INDUSTRIAL

3P Biopharmaceuticals and Biosergen completed manufacturing of biomass for the phase II clinical trial on mucormycosis "Black Fungus".

Under the URBIOFIN project, **AINIA**, in collaboration with NATUREPLAST, manufactured the first biodegradable bioplastic films with PHAs produced **CLaMber** using biowaste.



6.4 PRODUCT LAUNCHES

In this section, we have a list of the products and services launched to market and some of the most noteworthy deals to licence or distribute these products and services.

ASEBIO MEMBERS LAUNCHED 109 PRODUCTS AND SERVICES TO MARKET AND SIGNED IMPORTANT LICENSING DEALS

LICENSING AND DISTRIBUTIONS DEALS

Biofabri and Indian company Bharat Biotech agreed to join forces to develop, manufacture and distribute a new tuberculosis vaccine in more than 70 countries in Southeast Asia and Sub-Saharan Africa.

Bioiberica, announced a new strategic agreement with Mill Tech Co., Inc. for exclusive distribution of its line of hydrolysed proteins for animal nutrition, PalbioTM, in South Korea.

Celtarys Research and Chemspace signed a distribution agreement to commercialise Celtarys products.

Ferrer reached a deal with United Therapeutics for exclusive distribution rights to Tyvaso® (treprostinil), a pharmaceutical product that combines a drug and a device to treat pulmonary hypertension (WHO Group 3).

Leukos Biotech reached an agreement with Austrian company AOP Health to develop and commercialise LB208, the company's leukæmia molecule.

Minoryx and German company Neuraxpharm signed a licensing deal for the European rights to leriglitazone for orphan indication X-linked adrenoleukodystrophy (X-ALD).

Oncoheroes Biosciences and Allarity Therapeutics signed an exclusive global paediatric licensing deal for dovitinib, a pan-tyrosine kinase inhibitor, and stenoparib, a PARP inhibitor, both developed by Allarity.

PharmaMar announced its partner Boryung Corporation has been granted approval to commercialise Zepzelca® (lurbinectedin) in South Korea.

Syna Therapeutics, a joint venture of **Reig Jofre**, signed a global licensing deal with Intas Pharmaceuticals for BIOSIMILAR LB-0702 to treat conditions in the field of haematology.

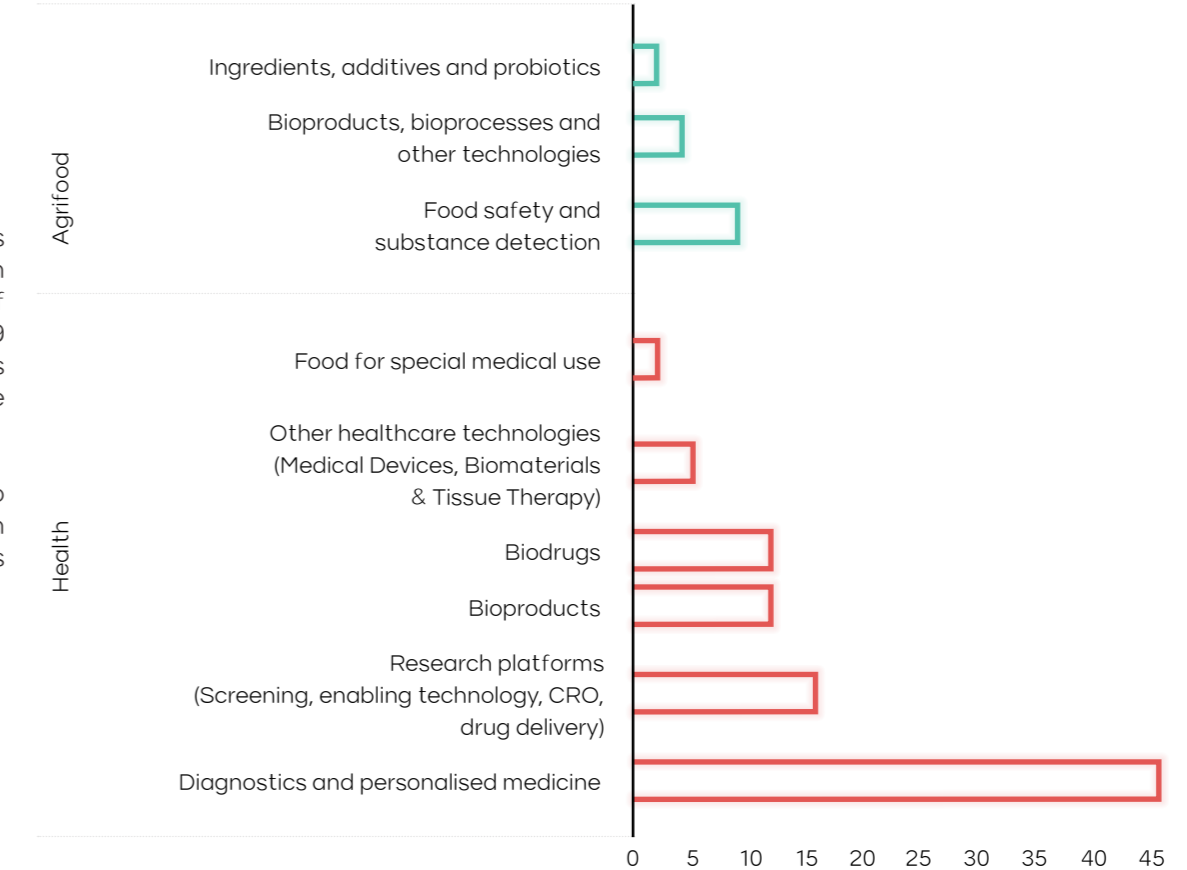
SOM Biotech signed a licensing deal with the University of Minnesota as a continuation of the in vitro studies they carried out on potential candidates for preclinical products for Duchenne and Becker muscular dystrophy, using the SOM Biotech platform, SOMAIPRO.

Tebrio announced it has launched to market an insect-based biofertiliser called Massógreen Frass with Comercial Química Massó.

PRODUCTS AND SERVICES LAUNCHED TO MARKET

Table 6.3 shows the full list of all the products and services, along with the indication for each one, and 6.8 shows the breakdown by areas of activity. In 2022, AseBio members launched 109 new products and services to market. This is down 15% from the previous year, when there were 127.

Like in 2020 and 2021, companies continued to launch solutions to fight SARS-CoV-2, although in a smaller proportion. There were nine products in total to diagnose or detect this disease.



GRAPH 6.8. Breakdown by area of activity for products and services launched to market by AseBio members. Source: AseBio.

TABLE 6.3.
Products and services
launched to market
by AseBio members in
2022.
Source: AseBio.

Organisation	Name of product/service	Indication of product/service
3P Biopharmaceuticals	New 2000-litre bioreactor	A 2000 L bioreactor to manufacture biological drugs in mammalian cell expression systems.
AbbVie	SKYRIZI (risankizumab) 150mg PRE-FILLED SYRINGE	Syringes pre-filled with 150 mg of risankizumab to treat plaque psoriasis and psoriatic arthritis.
AbbVie	SKYRIZI (risankizumab) 150mg PRE-FILLED PEN	Pens pre-filled with 150 mg of risankizumab to treat plaque psoriasis and psoriatic arthritis.
ADNTRO Genetics	Clinical pharmacogenetics	Pharmacogenetic analysis for personalised recommendations based on haplotypes and polymorphisms for over 70 drugs.
ADNTRO Genetics	Haplotipo APOE	Analysis of the APOE haplotype, strongly associated with the risk of developing Alzheimer.
Almirall	Wynzora	Treatment for mild to moderate plaque psoriasis in adults.
Araclon Biotech	ABtest-MS, CE-IVD	Analysis procedure to identify amyloid deposits in the brain of cognitively healthy individuals or people with mild cognitive impairment (MCI) by measuring the AB42/AB40 ratio.
Arthex Biotech	ENTRYTM Platform	Platform to develop oligonucleotides with improved, tissue-specific delivery to treat diseases with unmet medical needs.
AstraZeneca	Enhertu	Monotherapy to treat adult patients with unresectable or metastatic HER2 breast cancer.
AstraZeneca	Trixeo	Triple combination therapy in one device (ICS-LABA-LA-MA) for maintenance treatment in adult patients with moderate to severe Chronic Obstructive Pulmonary Disease (COPD).
AstraZeneca	Evusheld	Combination of two monoclonal antibodies (tixagevimab and cilgavimab) for passive immunisation of immunocompromised patients.
Biohope	Immunobiogram®	Functional test that predicts pharmacodynamic response to an immunosuppressive treatment by measuring in vitro the metabolic activity of the patient's PBMCs, activated immunologically, in response to immunosuppressive drugs.
Bioiberica	Atopivet collar	Cosmetic collar for dogs and cats that helps keep their skin healthy, moisturised and nourished.
BIOLAN HEALTH	COVID-19 Antigen Rapid Test-Self Test	Covid-19/SARS-CoV-2 rapid antigen test for self-diagnosis.
BIOLAN Microbiosensores	BIOWINE 7000	Portable, cloud-connected biosensor to quantify malic acid and gluconic acid in wine and must.

Organisation	Name of product/service	Indication of product/service
BIOLAN Microbiosensores	BIOWINE 3000	Cloud-connected biosensor to quantify malic acid, gluconic acid and residual sugar in wine and must.
BIOLAN Microbiosensores	BIOFISH 3000 YAKE	Cloud-connected biosensor to quantify Yake in tuna.
Biorizon Biotech	Reforzax-S	Formula designed to activate pathways to eliminate free radicals and reactive oxygen species that break down cell membranes.
Biorizon Biotech	Reforzax-H	Bioproduct that promotes biosynthesis of antioxidant enzymes to reduce metabolic damage.
Biorizon Biotech	Biobalance	Solution that stimulates the rhizosphere microbiome, able to combine greater mobility and more efficient absorption of macro- and micro-nutrients in the soil, optimising their benefits for the plant.
Biosfer Teslab	MetBalance Test	Blood analysis for global MR metabolomics profiling that also includes lipoprotein profiling (Liposcale® test), glycoprotein profiling, characterisation of the aqueous plasma metabolome (LMWM) and lipidome characterisation.
BTI Biotechnology Institute	HTL mouthguard	Customised, 3D printed mouthguard to alleviate and correct teeth clenching and grinding at night.
BTI Biotechnology Institute	Apnoea mouthguard	APNiA customised, 3D printed intraoral device to treat obstructive sleep apnoea and lower AHI.
BTI Biotechnology Institute	EDK1-SCP-US	Kit to prepare various autologous platelet-rich plasma formulations (PRGF-Endoret).
Celtarys Research	LUXendin551	3nmoles vial that allows for preparation of 30 ml of 100nM working solution GLP1R fluorescent antagonist, which shows high affinity for GLP1 receptor (pIC50 = 7.2 for GLP1R) modulating the receptor by orthosteric antagonism.
Celtarys Research	LUXendin762	3nmoles vial that allows for preparation of 30 ml of 100nM working solution GLP1R fluorescent antagonist, which shows high affinity for GLP1 receptor (pIC50 = 7.0 for GLP1R) modulating the receptor by orthosteric antagonism.

Organisation	Name of product/service	Indication of product/service
DR Healthcare	DAOkids	Paediatric dietary management of ADHD caused by DAO deficiency, as well as other associated gastrointestinal and dermatological disorders.
DR Healthcare	fibroDAO	Dietary management of symptoms associated with fibromyalgia, osteopathic pain and chronic fatigue caused by DAO deficiency.
Enzymologic	COVALfinder®	New therapeutic targets on the COVALfinder platform, which delivers characterisation of inactivation parameters for irreversible drugs: kinact (kinact/KI) and affinity (KI) as well as differentiating binding mechanisms in some cases in the early stages of discovery.
Enzymologic	KINETICfinder®	New therapeutic targets on the KINETICfinder platform, which analyses the kinetic profiles of drugs and obtains interaction parameters kon, koff, Kd and residence time.
Flomics Biotech	Petri	Online bioinformatics service to analyse metagenomic data.
Foundation for Biomedical Research of the Ramón y Cajal University Hospital	Diagnostic gene panel	New diagnostic panel for neurofibromatosis and congenital adrenal hyperplasia.
Foundation for Biomedical Research of the Ramón y Cajal University Hospital	Diagnostic gene panel	Updated gene panel for hearing loss.
Foundation for Biomedical Research of the Ramón y Cajal University Hospital	MAPAC2	App to help Emergency Departments reduce ineffective practices or those for which there are better alternatives.
Foundation for Biomedical Research of the Ramón y Cajal University Hospital	METADISC2	Statistical meta-analysis methods for studies assessing diagnostic accuracy.
Foundation for Biomedical Research of the Ramón y Cajal University Hospital	ADECUAS	Tool for adjusting to clinical practice.

Organisation	Name of product/service	Indication of product/service
HealthInCode	Lymphoma OncoKitDx	Genetic test to optimise diagnosis of lymphomas in oncology patients.
Histocell	Reoxderm Liquid	Cosmetic ingredient with antioxidant and anti-ageing properties.
IIC	Development of predictive models for patient studies	Development of predictive models for patient studies.
IMERETI	PRP ADVANCED	Platelet-rich plasma (PRP): concentrated solution of autologous platelets from blood that has been proven effective in boosting healing and stimulating regeneration of various tissues by boosting growth factors and proteins.
IRB BARCELONA	CGI-Clinics	New platform for genomic analysis of tumours.
IRB BARCELONA	Chemical Checker	New platform that uses bioactivity information associated with small molecules.
LabGenetics	PCR	Active Infection Diagnostic Test (PDIA) for SARS-CoV-2 associated with the disease Covid-19 via PCR.
LabGenetics	Rapid PCR	Active Infection Diagnostic Test (PDIA) for SARS-CoV-2 associated with the disease Covid-19 via rapid PCR.
LabGenetics	Antibodies	Active Infection Diagnostic Test (PDIA) for SARS-CoV-2 associated with the disease Covid-21 via antibody test.
LabGenetics	Antigens	Active Infection Diagnostic Test (PDIA) for SARS-CoV-2 associated with the disease Covid-22 via antigen test.
Laboratorios Rubió	Delcrin	Oral solution to prevent vitamin D deficiency in adults, teens and children with identified risk.
Laboratorios Rubió	Methofill PEN	Injectable solution in a pre-filled pen, indicated to to treat mild to moderate cases of rheumatoid arthritis, psoriatic arthritis, juvenile idiopathic arthritis and Chron's disease.
Merck	Proxy-CRISPR	CRISPR gene-editing technology that improves genome editing, opening the genome to splice the DNA, with more experimental options.
Merck	Exelead	CDMO to manufacture liposomes and lipid nanoparticles (GMP).

Organisation	Name of product/service	Indication of product/service
Merck	Early Screening Formulation Service	Service to screen lipids and design and manufacture lipid nanoparticles.
Merck	PBD Core	Service to select linkers and manufacture ADCs (GMP).
Merck	Chetosensar	Technology to boost solubility of ADCs.
Merck	Ronacare Epintegrity	Active ingredient to maintain skin integrity.
Merck	Polysorbate 20 and 80 high purity EMPROVE EXPERT	Surfactant excipient to stabilise formulas with biomolecules.
Merck	LFADs	Sequential model based on a variational auto-encoder that reduces observed spiking to a set of low-dimensional temporal factors, per-trial initial conditions, and inferred inputs.
Merck	Recombinant IgG Mouse	Replacement for mouse IgG from serum that provides a strictly controlled, non-animal blocking solution, simplifying import regulations.
Merck	Ronacare Hibiscus	Natural hibiscus extract with antioxidant and anti-inflammatory properties.
Merck	Ronacare Baobab	Natural Baobab extract with calming and protective properties.
MSD ESPAÑA	VAXNEUVANCE injectable in syringe with 0.5 ml / vial	Vaccine indicated for active immunisation for the prevention of invasive disease caused by <i>Streptococcus pneumoniae</i> serotypes 1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, 22F, 23F, and 33F in individuals 6 weeks of age and older.
MSD ESPAÑA	KEYTRUDA injectable monoclonal antibody for infusion that binds to the PD-1 receptor, boosting cytotoxic T cell activity	Injectable monoclonal antibody for infusion that binds to the PD-1 receptor, to treat renal carcinoma, colorectal cancer, triple-negative metastatic breast cancer, head and neck squamous cell carcinoma or 1L, and non-small cell lung cancer.
Natac	Satiereal	Saffron extract for appetite control.
Natac	Moodreal	Replica of saffron extract for emotional health.
Natac	Elimreal	Combination of natural plant extracts for weight control.
NIMGenetics	FEMyTest	Antigen test to quickly detect vaginitis.
NIMGenetics	ReceptIVFity	Non-invasive study of vaginal microbiome to analyse probability of reproductive success for IVF/ICSI.

Organisation	Name of product/service	Indication of product/service
NIMGenetics	Colotect	Non-invasive test for early detection of colorectal cancer (CRC) and precancerous lesions.
Noray Bioinformatics	NorayBio Software Platform	Software ecosystem to manage the full research cycle.
Noray Bioinformatics	NorayBanks Catalogue	Software to manage virtual sample catalogues.
Novartis	Kesimpta Ofatumumab	Monoclonal antibody targeting B cells to treat adult patients with relapsing multiple sclerosis.
NUCAPS Nanotechnology	NUCLA	Natural product that reduces salt in food, using a protein that controls the release of salt in the mouth, with a much lower sodium content.
NUCAPS Nanotechnology	GLUCOCAPS	Nanoparticles to control glycaemia in metabolic diseases like diabetes and obesity, using a plant protein from corn.
PharmActive	ABG+®	Unique aged black garlic ingredient, standardised to 0.1% S-allyl cysteine (SAC) by HPLC with antioxidant and cardioprotective properties.
Progenika Biopharma	Promonitor QUICK ADL	Rapid point-of-care lateral flow test (LFT) based on a sandwich immunoassay to quantify adalimumab (ADL).
Promega Biotech Ibérica	OncoMate™ MSI Dx Analysis System	IVD PCR-based fragment-sizing test used to determine microsatellite instability (MSI) status.
Promega Biotech Ibérica	GoTaq® Enviro RT-qPCR System	RT-qPCR systems for environmental samples. Resistant to inhibitors and with hot-start technology to work at room temperature and fast cycles.
Promega Biotech Ibérica	GoTaq® Enviro qPCR System	qPCR systems for environmental samples. Resistant to inhibitors and with hot-start technology to work at room temperature and fast cycles.
Promega Biotech Ibérica	SARS-CoV-2 (N+E) RNA Quant Standard	RNA fragment encoding the nucleocapsid (N) gene and the envelope (E) gene of SARS-CoV-2 that serves as a stable quantitation standard in wastewater..
Promega Biotech Ibérica	PMMoV RNA Quant Standard	RNA that encodes a fragment of the PMMoV genome and serves as internal control for SARS-CoV-2 determination in wastewater.
Promega Biotech Ibérica	IAC RT-qPCR Inhibition Control Assay, CAL Fluor® 560	Internal positive control to determine DNA polymerase performance in RT-qPCR inhibition assays.

Organisation	Name of product/service	Indication of product/service
Promega Biotech Ibérica	GoTaq® Enviro PMMoV Quant Kit, Quasar® 670	Positive control kit to standardise data for epidemiology based on wastewater, including patented enzymes and formulations even in the presence of reverse transcriptase (RT) and PCR inhibitors; used to identify faecal contamination and water pathogens.
Promega Biotech Ibérica	Maxwell CSC IVDR	Automated nucleic-acid extractor for IVD environment, 1-16 samples.
Promega Biotech Ibérica	Maxwell CSC 48 IVDR	Automated nucleic-acid extractor for IVD environment, 1-48 samples.
Promega Biotech Ibérica	Maxwell CSC IVDR Kit for Whole Blood DNA	IVDR assay for automated high-quality DNA extraction in Maxwell from whole-blood samples.
Promega Biotech Ibérica	Maxwell CSC IVDR Kit for Blood DNA	IVDR assay for automated high-quality DNA extraction in Maxwell from blood samples.
Promega Biotech Ibérica	Maxwell CSC IVDR Kit for Blood RNA	IVDR assay for automated high-quality RNA extraction in Maxwell from blood samples
Promega Biotech Ibérica	Maxwell CSC IVDR Kit for DNA FFPE	IVDR assay for automated high-quality DNA extraction in Maxwell from FFPE tissue samples.
Promega Biotech Ibérica	Maxwell CSC IVDR Kit for RNA FFPE	IVDR assay for automated high-quality RNA extraction in Maxwell from FFPE tissue.
Promega Biotech Ibérica	Maxwell CSC IVDR Kit for Viral Total Nucleic Acid	IVDR assay for automated high-quality viral total nucleic acid extraction in Maxwell.
Promega Biotech Ibérica	Maxwell CSC Genomic DNA Kit	Automated kit for Maxwell to extract genomic DNA from a wide range of human samples for in vitro diagnostic assays.
Promega Biotech Ibérica	Maxwell RSC Genomic DNA Kit	Automated kit for Maxwell to extract and purify genomic DNA from a wide range of human samples for in vitro diagnostic assays.
Promega Biotech Ibérica	Maxwell HT ccfDNA Kit	Kit for high-throughput, automated extraction of cell-free DNA from plasma, serum, urine or CSF.

Organisation	Name of product/service	Indication of product/service
Promega Biotech Ibérica	Maxwell HT Fecal Microbiome	Kit for automated DNA extraction from faeces.
Promega Biotech Ibérica	Lumit™ cytokine assays	Bioluminescent assay to detect cytokines released by cultured cells.
Promega Biotech Ibérica	Lumit™ Glucagon Immunoassay	Homogeneous bioluminescent assay to detect glucagon in solution, without wash steps.
Promega Biotech Ibérica	NanoBRET™ Target Engagement (TE) Intracellular Kinase Assays CDK11A and CDK11B	Assays to measure compound cellular affinity and live-cell occupancy for target proteins.
Promega Biotech Ibérica	TransfectNow™ HEK293 Cells	HEK293 cells ready to be used in transfection experiments.
Promega Biotech Ibérica	FuGENE® 4K Transfection Reagent	DNA transfection reagent with high efficiency and low toxicity.
Promega Biotech Ibérica	FcyRI ADCP Reporter Bioassay	Bioassay to measure potency and stability of antibodies with FcyR-mediated MOA.
Quibim	QP-Prostate	Image-processing software for computer-aided detection and diagnosis (CADE/CADx) that automatically detects and identifies suspicious regions of the prostate gland using multi-parameter or bi-parameter prostate MRIs with two levels of probability: low and high.
Reig Jofre	TRIFERTY-ATM®	Food supplement that helps promote male fertility.
Reig Jofre	DexULac®	Medicated nail varnish for onychomycosis with new transungual delivery.
Swedish Orphan Biovitrum	Waylivra 285 mg injectable solution in pre-filled syringe	Dietary supplement for adult patients with genetically confirmed familial chylomicronaemia syndrome (FCS) and high risk of pancreatitis whose response to diet and reducing triglycerides hasn't been sufficient.
Sylentis	CDMO oligonucleotides	CDMO services for GMP and non-GMP manufacturing of oligonucleotides.
VITRO	Kit RESPI+	In vitro diagnostic kit for the simultaneous qualitative detection and differentiation of Respiratory Syncytial Virus (RSV), Influenza A, Influenza B and SARS-CoV-2.

Organisation	Name of product/service	Indication of product/service
ZeClinics	Depigmentation	Study to assess the pigmentation capacity of compounds.
ZeClinics	Dravet Syndrome model	Animal model to study, develop and screen compounds for Dravet Syndrome.
ZeClinics	Gastrointestinal inflammation model	Animal model to study, develop and screen compounds for gastrointestinal inflammation.
Zendal/CSIC	Leishmaniasis canina vaccine	Vaccine for leishmaniasis canina.





Health and food for all: the new gene-editing revolution

While 2021 was about the crisis caused by Covid-19, 2022 was dominated by the Russian invasion of Ukraine and its impact. These facts have reminded us of the importance of health and nutrition, clearly highlighting the value of food production and supply.

Guided by our purpose, "Science for a better life", we bring revolutionary innovations in health and agriculture. We are helping build a world where diseases are not only treated, but effectively prevented or cured; where self-care is a key part of health and we produce enough food for everyone, while respecting our planet's natural resources. We're working to make our vision of "Health and food for all" come true.

In 2022, our Pharmaceutical Division continued working on its process to transform research and development. For example, using novel technologies has unlocked new ways of developing precision therapies to tackle challenges that were impossible with traditional tools, for serious cancer and immune disorders. Our cell and gene therapy platform was significantly strengthened in 2022 through a collaboration with Mammoth Bioscience, Inc., in the field of innovative gene-editing technology (CRISPR systems).

In Crop Science, we promoted development of innovative products and services that adapt to farmers' individual needs. We develop cutting-edge technologies and innovations to boost our clients' productivity and, therefore, improve food security and help farmers further reduce the environmental impact of agriculture.

At Bayer, we believe that ensuring food security and mitigating climate change won't be possible without innovation in agriculture, including the use of new techniques like CRISPR gene editing. These techniques develop characteristics in crops that make them more resistant to environmental stresses such as drought and strong winds, as well as pests, diseases and weeds, which means less use of plant protection products and higher yields. We hope to obtain corn that is more resilient to climate change and has a higher yield, soya with higher-quality protein and more resistant to Asian soybean rust and virus-resistant tomatoes, among others. These techniques also allow us to offer consumers higher-quality food that is more nutritious and tastes better.

Biotechnology using new genomic techniques, in combination with agricultural practices designed to preserve the topsoil and cut CO2 emissions, opens up huge opportunities to make agriculture and the whole food chain more sustainable.



Bayer

Madrid Science Park, the place to grow your biotechnology projects

The Madrid Science Park Foundation (FPCM) is an essential piece of the system and structure supporting new biotechnology companies, with a firm commitment to this booming sector of the economy from the universities involved: the Autonomous University of Madrid (UAM) and the Complutense University of Madrid (UCM), the Spanish National Research Council (CISC), Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas en Madrid (CIEMAT), and the Madrid City Council and Autonomous Community.

The value of the FPCM as an incubator for science/technology projects lies in building an effective grouping of professional services and facilities to ensure that new biotechnology companies develop and mature in the best conditions to successfully compete in the market. Deep tech firms, companies providing disruptive solutions based on technology with ties to science or engineering, are precisely the type of project that can most benefit from the services the Park offers. In 2022, the Park was home to 49 companies in the life sciences, chemistry, environment, engineering and new materials sector (61% of all member companies this year).

Pre-equipped laboratories, shared science equipment and personalised support for technicians in preparing experiments and samples help new companies focus their energy and efforts on what really matters: speeding up processes, which is essential to their consolidation. Plus, FPCM has a genomics platform that offers comprehensive science services, which 252 projects made use of in 2022.

The FPCM leads and is part of programmes to support acceleration and scale-up of projects, such as CaTapull UP, launched with support from the Madrid City Council to address today's challenges and opportunities and to promote entrepreneurship in science and technology with a high impact on the city. It provides direct, personalised guidance for deep tech companies, focused on improving four key areas of business: team, funding, product and market. Currently, nine companies are participating in the second edition of the programme developing innovative solutions in foodtech, medtech, drug delivery, drug discovery, quantum computing and artificial intelligence, with high potential for growth and up to three years since founding. Another programme FPCM takes part in is APTENISA, a nationwide project promoted by the

Association of Science and Technology Parks of Spain (APTE), co-funded by Enisa and coordinated by FPCM with La Salle Technova Barcelona. The FPCM was in charge of designing, kicking off and executing the project and its various programmes. APTENISA was created to support deep tech entrepreneurship in all its phases, through methodology shared among all the science and technology parks in Spain. In 2022, the first edition of the programme was held, supporting 100 entrepreneurs with business ideas based on science and technology, accelerating 32 teams of entrepreneurs and start-ups with the same profile and training 50 business angels.

To tackle the internationalisation of the most competitive SMEs, the Madrid Science Park, as a member of the Enterprise Europe Network (EEN), offers a series of free services to help companies internationalise in new markets and scout for partners, providers or distributors to commercialise their products and services, providing personalised advisory services about any issues related to the European Union and third parties, among others.

Madrid Science Park Foundation



COLLABORATION AND INTERNASIONALISATION

2022 AseBio Report

07



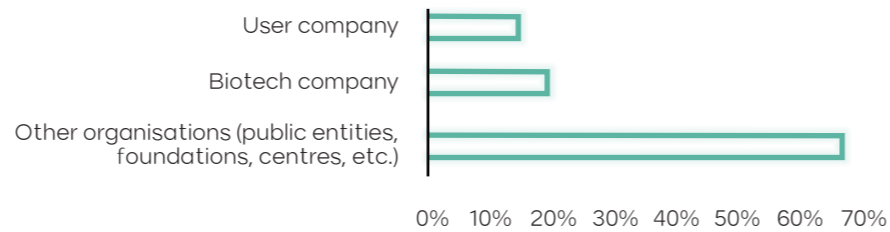
7.1 COLLABORATION

Collaboration is key in explaining the work of AseBio members. That's why, each year, this Report compiles the partnerships or collaborations among biotechnology companies, as well as an analysis of the participants in these partnerships, their country of origin and purpose.

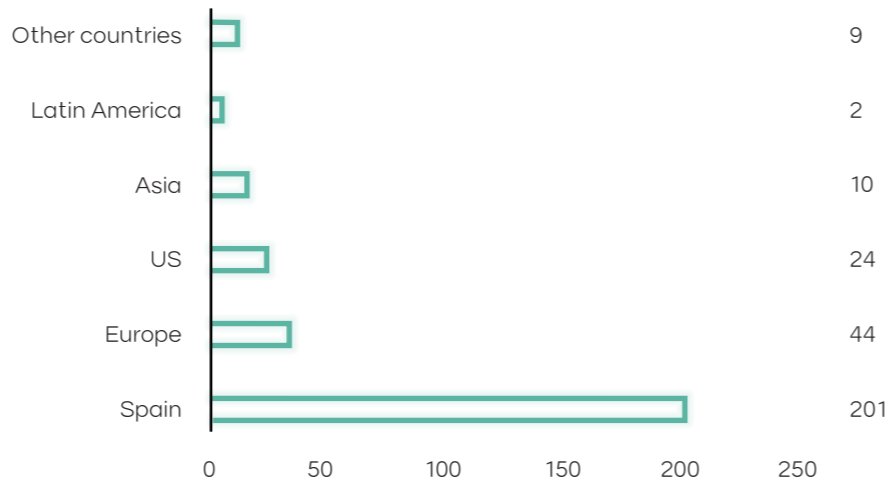
PARTNERSHIPS UP 35% IN 2022 TO 295, 189 WITH PUBLIC ENTITIES AND FOUNDATIONS

Regarding the change in number of partnerships biotechnology companies entered into, this number is up 49% from 2018, from 198 partnerships identified in 2018 to 295 in 2022 (graph 7.1).

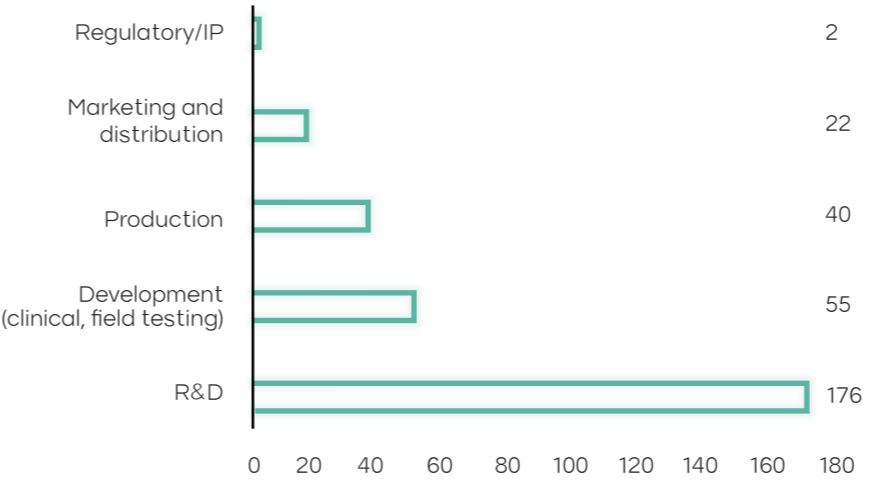
With these 295 agreements or collaborations, the total is up 35% from 2021. Public-private partnership stands out, with 189 agreements with public research centres or foundations. This is mainly due to grant calls that require consortia to be set up including public bodies, such as the grant calls for public-private partnerships and the State Research Agency Strategic Lines programme. This is followed by collaborations with another biotech firm and, finally, collaborations with user companies.



In terms of country of origin of the entities they reach collaboration agreements with (graph 7.3), 31% are international organisations, down 20% from last year. Of these, 24 collaborations were with the United States and 10 with Asian countries.



Regarding the purpose of the collaboration (graph 7.4), 60% focus on research and development, trailed by collaborations for clinical development or field studies, which are on a similar level to production deals. 22 of the deals were related to marketing and distribution of products and, lastly, those concerning regulatory or industrial protection issues.



RESEARCH AGREEMENTS:

3P Biopharmaceuticals and BrainEver announced a collaboration to develop recombinant human homeoprotein Engrailed-1. 3P will focus on transferring the production process, as well as cGMP manufacturing of the drug to be used in the phase I and II clinical trials and to treat neurodegenerative diseases like amyotrophic lateral sclerosis.

OLIGOFASTX kicked off the multidisciplinary consortium led by **Sylentis** that also includes **53Biologics**, Nanovex Biotechnologies, **Arthex Biotech**, Aptus Data Labs, **aptaTargets** and **Nostrum Biodiscovery**. It aims to create a comprehensive platform to facilitate and contribute to accelerated development of therapies based on oligonucleotides in Spain.

CerTest Biotec, with **53Biologics**, LevProt Bioscience, Inbiolev and **Innoup Farma**, and the **University of Navarra** and the University of Zaragoza as outsourcing centres, kicked off a project to develop thermostable mRNA vaccines for the delta variant of SARS-CoV-2.

Atrys Health and Champalimaud Foundation established a collaboration agreement to jointly develop advanced therapeutic and diagnostic procedures.

Bioiberica announced a partnership with ByHealth, a Chinese supplier of vitamins and food supplements, to develop Highflex, a new product for joint health.

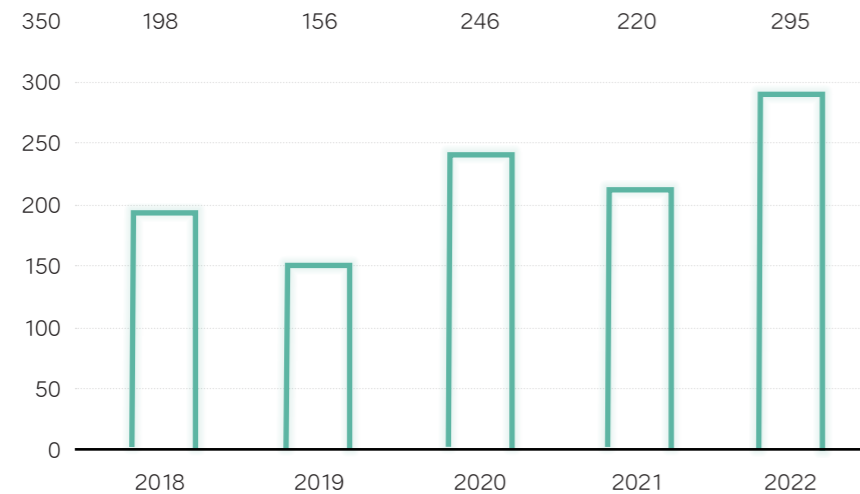
Biorizon Biotech began participating in the Horizon Europe project REALM – “Reusing Effluents from Agriculture to unlock the potential of Microalgae”. The project is developing technology to turn microalgae biomass into new biostimulants and biopesticides for agriculture.

BTI Biotechnology Institute reached an agreement with the Medicalmix Group, which commercialises the ENDORET technology (PRGF® - Plasma Rich in Growth Factors) for traumatology, dermatology and reproductive medicine at public hospitals in Spain and all healthcare centres in Portugal.

CENER with Bioquochem, Repsol, Roka Furadada, Smurfit Kappa,

GRAPH 7.4. Breakdown of partnerships in the Spanish biotechnology sector in 2022 by purpose of the alliance. Source: AseBio.

GRAPH 7.1. Evolution of the number of partnerships in the Spanish biotechnology sector from 2018 to 2022. Source: AseBio.



GRAPH 7.2. Breakdown of partnerships in the Spanish biotechnology sector in 2022 by partner profile. Source: AseBio.

GRAPH 7.3. Breakdown of partnerships in the Spanish biotechnology sector in 2022 by partner origin. Source: AseBio.

Centro Tecnológico Riojano, ASINCAR, and Inveniam kicked off ZEBRA-LIFE, a project to produce antioxidants from renewable sources using industrial subproducts from the paper sector. Also CENER, with AIN, CUN, Trasa, Ingredalia, Cocuus System Ibérica, Bioeder and Bionanoplus, announced its participation in the Imprimed project to produce a new family of biopolymers from agrifood subproducts to be used in 3D printing in the biomedical sector.

Corify Care and **Genesis Biomed**, announced they are taking part in the Digi-Heart project, which aims to complete the value chain in development of new treatments, drugs and medical devices through an innovative technological platform for clinical trials with human digital twins.

Histocell, with Domotek, Ekolber, Graphenea, IMG Pharma Biotech, Mepro, Polimerbio, Tecbiocel, Tecnalia Certificación and Unikare Bioscience, kicked off the ITEAS project for research into advanced therapy drugs to generate new therapeutic strategies for complex diseases and improve quality of life during the ageing process.

Integra Therapeutics announced its participation, alongside Pompeu Fabra University (UPF) and the Josep Carreras Leukaemia Research Institute (JC) in the FiCAT project to develop a new genetic-engineering technology for a CAR-T therapy to treat T-cell acute lymphoblastic leukaemia (T-ALL).

IOMED announced it is partnering with the Puigvert Foundation to research neuro-nephro-andrology and with the University of Navarra Clinic to optimise clinical research. IOMED will loan

its artificial intelligence (AI) tool to the Puigvert Foundation to reduce the time it takes to get data for clinical research and the University of Navarra Clinic to optimise access to patients' clinical data.

Laboratorios Rubió announced a collaboration with Sincrolab, which has developed technology based on artificial intelligence to treat ADHD. This collaboration will work to improve ADHD treatment.

Leukos Biotech, a spin-off of the Josep Carreras Leukaemia Research Institute, reached an agreement with AOP Health to develop and commercialise LB208.

Nucaps and Blendhub joined forces to develop personalised functional ingredients for the nutrition and health industries.

Vall d'Hebron Research Institute (VHIR) and **Oncoheroes Biosciences** announced their collaboration to discover and develop innovative therapies for paediatric sarcomas.

ORYZON announced a preclinical collaboration on Kabuki syndrome with the Kennedy Krieger Institute and Johns Hopkins University and signed an agreement with the US National Cancer Institute to develop iadademstat in different types of cancer.

Vitro signed an agreement with Cells IA to commercialise artificial intelligence (AI) algorithms for diagnosis in pathological anatomy units with digital pathology.

ZeClinics joined forces with the Vision Institute to test gene-editing technologies in zebrafish

to develop innovative approaches to complex genetic modifications.

ZYMVOL announced a partnership with biochemical company CYGYC BIOCON to improve performance of enzymes in detergent formulas to move towards more eco-friendly household solutions.

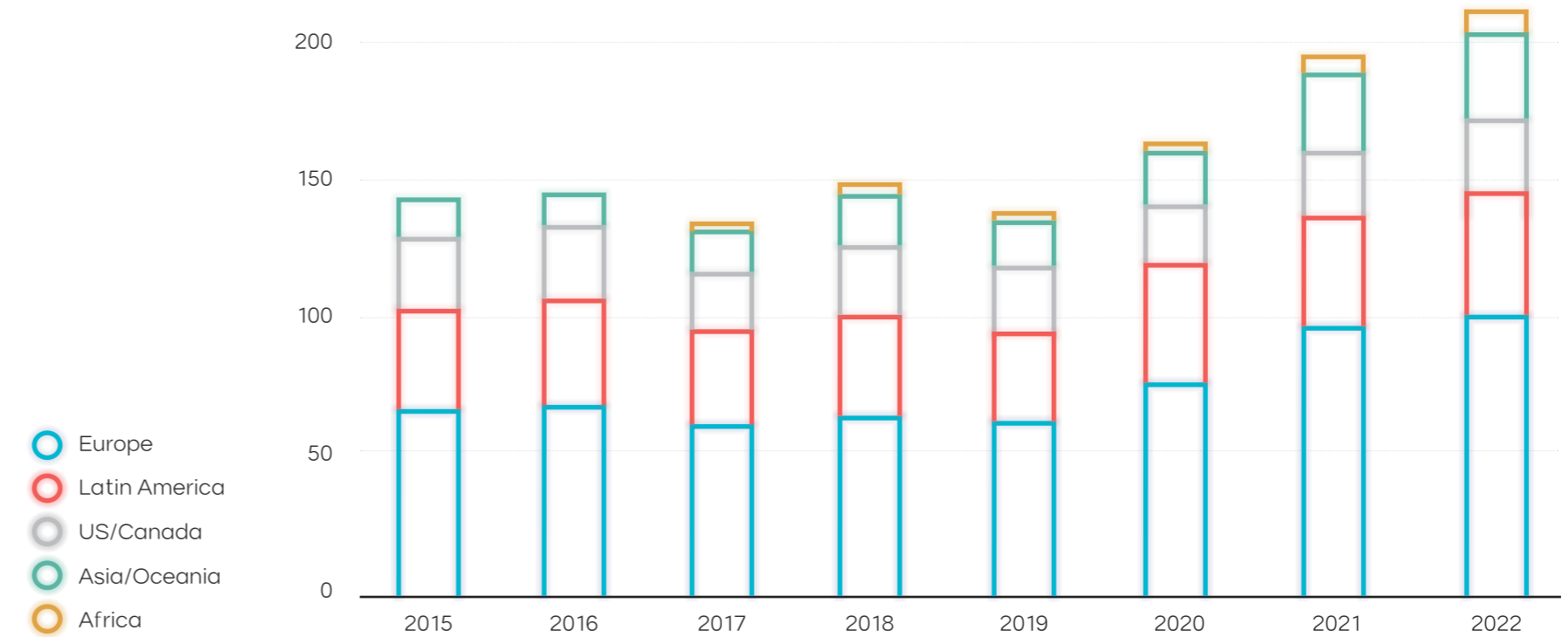
7.2 ATTRACTING INTERNATIONAL COMPANIES

ASEBIO MEMBER COMPANIES INCREASE INTERNATIONAL PRESENCE 20% IN 2022

43 AseBio members (4 more than the previous year) have a direct presence in 56 countries on all continents (5 more than last year).

The total number of subsidiaries of our members outside of Spain in 2022 was 211, 16 more than in 2021.

If we look at where members decide to set up subsidiaries by geographic zone, the most popular region is Europe (48%), followed by Latin America (21%). Then come countries in Asia (15%), which remains ahead of the United States and Canada (12%), and finally countries in Africa, which although growing in recent years are at 4%.



GRAPH 7.5. Evolution of presence of AseBio member companies by geographic zones (2015-2022). Source: AseBio.

The United States is the country with the most subsidiaries (24), followed by Portugal with 13, Germany and Mexico with 11 each, France with 10, and Brazil and Italy with 9 each.

As we've seen, France has dropped three positions, with two fewer subsidiaries than the previous year, while Portugal jumped to second on the ranking of subsidiaries by country and the US remained in first. The growth of subsidiaries in Mexico is also noteworthy, moving into fourth with 11.

Table 7.1 shows where our Spanish companies are present by country and the number of subsidiaries in each market, while table 7.2 is a list of AseBio members with the countries where they have a direct presence.

Country	No. of subsidiaries		
US	24	Japan	2
Portugal	13	Malaysia	2
Germany	11	Morocco	2
Mexico	11	South Africa	2
France	10	Angola	1
Brazil	9	Saudi Arabia	1
Italy	9	Algeria	1
United Kingdom	9	Bolivia	1
Belgium	7	South Korea	1
Chile	7	Costa Rica	1
Switzerland	7	Croatia	1
China	6	Denmark	1
Poland	6	Ecuador	1
Colombia	5	Egypt	1
Peru	5	United Arab States	1
Singapore	5	Slovakia	1
Sweden	5	Philippines	1
Argentina	4	Finland	1
Austria	4	Greece	1
India	4	Hungary	1
Czech Republic	4	Indonesia	1
Netherlands	3	Ireland	1
Thailand	3	Luxembourg	1
Turkey	3	Monaco	1
Australia	2	Panama	1
Canada	2	Romania	1
Israel	2	Russia	1
		Taiwan	1
		Vietnam	1

Company	Countries
Ackermann International	Canada, US, Mexico, Panama, Colombia, Peru, Chile, Argentina, Brazil, South Africa, Italy, United Kingdom, France, Belgium, Netherlands, Germany, Switzerland, Czech Republic, Hungary, Poland, Denmark, Greece, Turkey, Israel, Singapore, China
Agarose Beads Technologies	US
Agrocode	Brazil, China, US, Peru
AINIA	Portugal
AlgaEnergy	US, India, Italy, Japan, Mexico, Turkey, Australia, France, Brazil
Almirall	Germany, Austria, US, Netherlands, Italy, Poland, United Kingdom, Switzerland, France, Slovakia, Czech Republic
AMS Lab	Italy, Morocco, Portugal
Antares Consulting	Belgium, Bolivia, France, Portugal
Arquimea	Germany, US, Malaysia
Asphalion	Germany, United Kingdom
Atrys Health	Colombia, Chile, Brazil, Portugal, Switzerland, Peru
BBI bcn	United Kingdom, Mexico
Biobide	US
Bioibérica	Germany, Brazil, US, Italy, Poland
Biolan	Chile, Ecuador, Indonesia, Mexico, Portugal, Morocco, Thailand, Philippines
BTI Biotechnology Institute	Germany, US, Italy, Mexico, Portugal, United Kingdom, France
Elzaburu	China
Eurosemillas	US, Angola
Ferrer	Germany, Belgium, Costa Rica, Chile, US, Mexico, Peru, Portugal, Austria, Netherlands, Luxembourg
Genómica	China, Sweden
Grifols	Germany, Saudi Arabia, Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Colombia, South Korea, US, Egypt, France, India, Ireland, Italy, Japan, Malaysia, Mexico, Poland, Portugal, United Kingdom, Czech Republic, Singapore, Sweden, Switzerland, Thailand, Taiwan

TABLE 7.1.
Breakdown of subsidiaries of AseBio member companies.
Source: AseBio.

TABLE 7.2.
AseBio members and countries where they have a direct presence. Source: AseBio.

Company	Countries
HelixBios	Peru
Laminar Pharma	US
Leti	Germany, Portugal
LiberaBio	US
Mabxciencia	Argentina, Switzerland
Minoryx Therapeutics	Belgium
Natac Biotech	US, Singapore
Neurofix	US
Nimgenetics	Brazil, Mexico, Portugal
Oncoheroes	US
Oryzon	US
PharmaMar	Germany, Austria, Belgium, US, France, Italy, Switzerland
PV Pharm	Czech Republic
QualitecPharma	US
Quibim	US
Reig Jofré	Belgium, US, France, Portugal, United Kingdom, Singapore, Poland, Monaco, Sweden
Sanifit	US
Sermes CRO	Chile
Proteos Biotech	Colombia
Valtria	Argentina, Mexico, Chile, France, Switzerland, Finland, Algeria, Sweden, Portugal
Venair	China, US, Poland, Sweden, South Africa, United Kingdom, France, Vietnam, Turkey, Russia, Romania, Brazil, India, Thailand, Germany, Italy, Singapore, Colombia, Croatia, Mexico, Brazil, Israel
Vitro	Portugal





Mikrobiomik is leading the paradigm shift with gut microbiota

Mikrobiomik is a biopharmaceutical company focused on research, development and production of medicines based on the human microbiome.

Mikrobiomik aspires to be the first company in the world to commercialise in the European Union the first oral biological drug based on gut microbiota for primary or recurrent infection with *Clostridioides difficile*, with a single dose of four capsules with FSPIM technology (Full Spectrum & Purified Intestinal Microbiota).

Mikrobiomik has one facility with GMP (Good Manufacturing Practices) certification for Europe from the regulatory agency, in this case AEMPS (Spanish Agency of Medicines and Medical Devices), which allows it to distribute its first experimental biological drug, MBK-01, for use in clinical trials.

Mikrobiomik will publish, in late 2023, the results of its phase III trial on primary or recurrent infection with *Clostridioides difficile*, after obtaining promising intermediate results compared to the current standard of care, the antibiotic

fidaxomicin, and is in conversations with the EMA (European Medicines Agency) to apply for registry and then authorisation to commercialise MBK-01 to be administered by central line. Through the first half of 2023, we have supplied 17 compassionate uses authorised by AEMPS to patients who could not be included in the phase III trial, as they had no therapeutic alternative after all others had failed. The company supplied MBK-01 to the hospitals completely free of charge for these cases.

In 2023, Mikrobiomik will launch new clinical trials, including a phase II placebo-controlled study for the indication of non-alcohol related steatohepatitis, as well as proof-of-concept in metastatic cancers of the stomach, colon and pancreas that don't respond to two or three lines of treatment.

Mikrobiomik signed a framework agreement with Ramón y Cajal Institute for a public-private partnership to carry out clinical development to reach the market with any experimental trial for any condition, with 100% proof of safety and efficacy, through treatment with gut microbio-

ta capsules. Mikrobiomik has started developing its artificial intelligence platform MTBDP (Microbiota Tracking Between Donors & Patients) based on meta-genomic analysis of both donors and patients in clinical trials in order to develop new, customised biological medicines based on DD (Donor-Disease) microbiota profiles.

Mikrobiomik plans to launch their first research drug, MBK-01, in the first half of 2025, making it the first oral biological drug based on gut microbiota in the world to treat primary or recurrent infection with *Clostridioides difficile* with a single dose of four capsules with FSPIM technology (Full Spectrum & Purified Intestinal Microbiota).



NEW TECHNOLOGIES

2022 AseBio Report

08

The impact of new digital technologies on all areas of society, including biotechnology, is growing. Thanks to them, we have better chances to achieve great things in social progress, and more potential to provide companies with new capacities.

This section is an analysis of the relationship between biotechnology and new technologies, showing which have the greatest potential in the sector, how they are being applied and the hurdles blocking their implementation and use.

To compile this information, AseBio surveyed its members between October and December 2020 and updated the information in April 2023, to find out to what extent new technologies are being developed and used in the biotechnology sector.

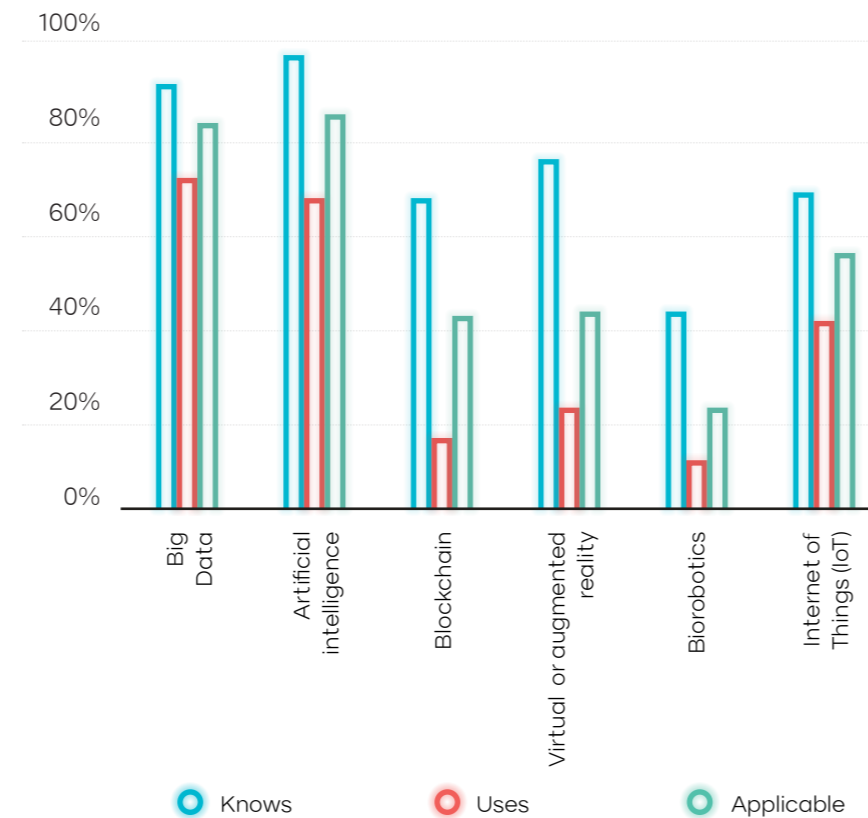
There were 96 organisations that completed the survey, 67% focusing on healthcare biotechnology, 20% on other activities (such as venture capital investors or specialised services), 9% on agrifood and 4% on industrial biotechnology.

8.1. DEGREE OF IMPLEMENTATION AND INTEREST

The most well-known new digital technologies among the companies surveyed are artificial intelligence, at 96%, and big data, at 91%, and the least well-known is biorobotics, which only 41% of those surveyed reported they are aware of. Of those surveyed, 76% know of virtual or augmented reality, 67% know of the Internet of Things (IoT) and, finally, 62% are aware of blockchain.

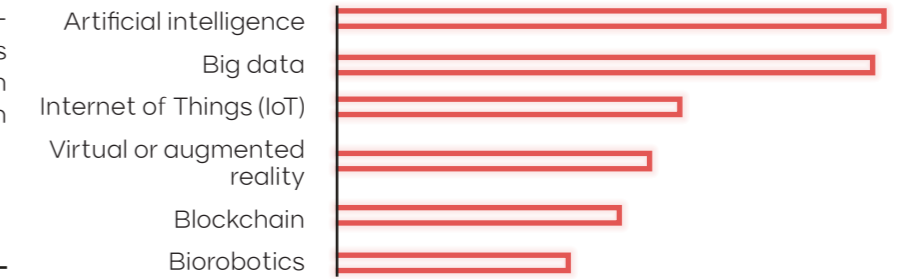
In terms of use, big data is the most widely used, at 68% of the companies surveyed. It is followed by artificial intelligence (61%) and the Internet of Things (39%).

By applicability, artificial intelligence, big data and IoT are considered the most applicable, with 85% for artificial intelligence, 82% for big data and 57% for IoT. Trailing these we have virtual or augmented reality (41%), blockchain (40%) and, finally, biorobotics (21%). In the case of biorobotics, this may be because not all biotechnology companies have the option to use this technology in their processes, given their activity.



GRAPH 8.1. Knowledge, use and applicability of new digital technologies for companies.

The most interesting new technologies, given their potential for application in companies' processes both internally and to explore new business models, are artificial intelligence and big data. Unlike the results from 2020, IoT is now third and virtual or augmented reality is not far behind, in fourth. The final two are blockchain and biorobotics.



GRAPH 8.2. Ranking of new technologies by their potential application in companies' processes both internally and to explore new business models.

Below we have the most relevant applications of each new digital technology for biotechnology companies:

BIG DATA

- Analyse genomic, omic or proteomic data
- Analyse client and market data/marketing
- Analyse clinical data
- Analyse transcriptomic data and processing functional validation data
- Predictive and diagnostic analysis
- Discover new molecules
- Discover biomarkers
- Digitalise agriculture and decision-making
- Identify risk factors CRC
- Personalised and translational medicine
- Information to develop computational models
- Predict toxicity/efficacy
- Production and logistics



ARTIFICIAL INTELLIGENCE

- Analyse data
- Automate and optimise processes
- Drug design and development
- Control and improve processes
- Develop algorithms to diagnose diseases
- Discover new molecules
- Discover biomarkers
- Review and draft scientific data
- Predictive models



BLOCKCHAIN

- Manage patients' clinical data
- Digital certificates
- Protect intellectual property
- Manage stocks, quality policy, administration, finances
- Security and improve process flows
- Follow up on commercialisation processes
- Follow up on traceability of results



BIOROBOTICS

- Automate processes
- Biological characterisation of some internal studies
- Discover new molecules
- Discover biomarkers
- Study in vivo types of cells and their functions



INTERNET OF THINGS (IOT)

- Virtual assistant
- Mine information
- Commercialise services
- Connectivity between bioprocesses equipment
- Automate control of processes
- Manufacturing
- Exchange data
- Web services for users and app development
- Wearable monitoring systems



VIRTUAL OR AUGMENTED REALITY

- Control and improve processes
- Training
- Virtual modelling
- Imaging and microscopy
- Project and view 3D images
- Simulation for biomedical projects
- Telehealth

8.2. ROADBLOCKS TO IMPLEMENTATION

For each technology, survey participants were asked to choose which of the roadblocks given most hinders its use in the processes of the biotechnology company.

The roadblocks and limitations assessed were lack of knowledge, lack of suppliers, level of maturity or development, lack of regulation and lack of training.

For technologies like big data, the main limitation is lack of training, followed by level of maturity or development, lack of regulation, lack of knowledge and lack of suppliers.

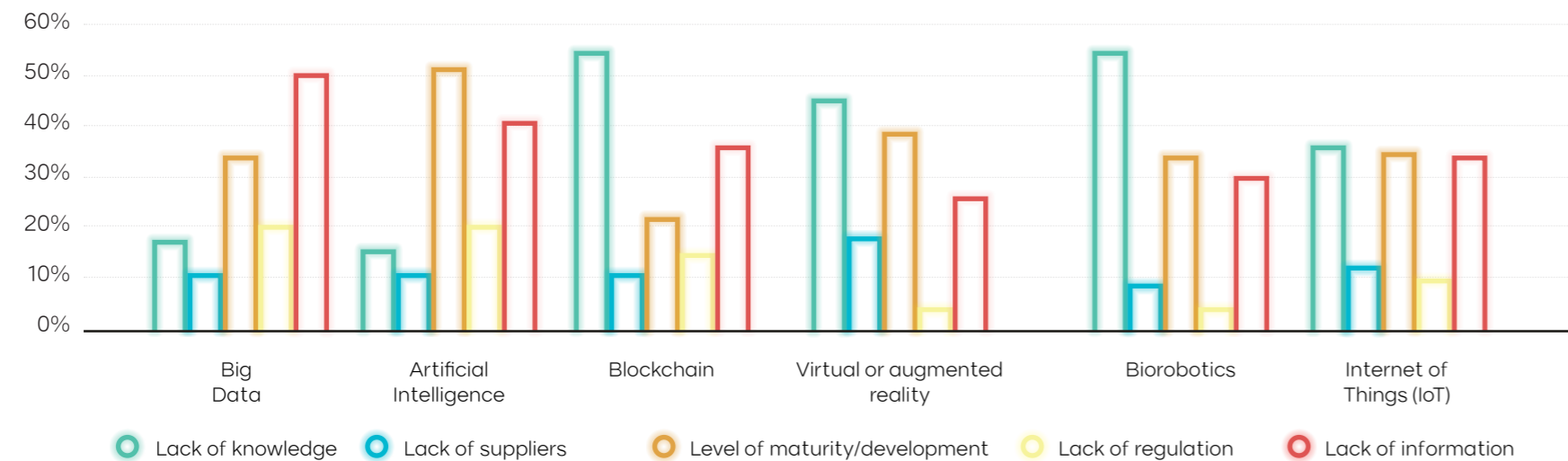
In terms of artificial intelligence, unlike big data, the main barrier is the level of maturity or development, followed closely by lack of training. At a greater distance, we have lack of regulation, lack of knowledge and lack of suppliers.

For blockchain, the main barrier is lack of knowledge, followed by lack of training, level of maturity or development, lack of regulation and lack of suppliers.

For biorobotics, the main roadblock by far is lack of knowledge. To a far lesser degree, this is followed by level of maturity or development

and lack of training, at the same level. At an even greater distance, we have a lack of suppliers and, finally, a lack of regulation.

Finally, for the Internet of Things, lack of knowledge is considered the main roadblock, followed by level of maturity or development, lack of training, lack of suppliers and, finally, lack of regulation.



GRAPH 8.3. Roadblocks to implementation of each of the new technologies in terms of using/applying them in processes at a biotechnology company.

8.3 DIGITAL TOOLS FOR DRUG DISCOVERY

As there are many diseases with unmet medical needs, drug discovery is a key activity in developing new medicines and, therefore, the focus of a significant number of biotechnology companies. For these biotechnology companies, new digital tools are great allies in analysing more molecules and data than with traditional methods and processing more information so decisions can be made faster.

Observing the use of digital tools in drug discovery, big data is the most commonly used, mainly to analyse information on molecular structures, such as proteins, RNA and chemical molecules, among others, and to obtain bibliographic data.

Machine learning and advanced statistical methods are the main applications of artificial intelligence, as well as other tools like network analysis, deep learning and natural language processing, which are also used for studies on pathology evolution and prediction.

Virtual or augmented reality, although not used intensively in drug discovery, is starting to be used for storing and viewing data and computer vision, as well as studies on how molecules interact with 3D protein structures.

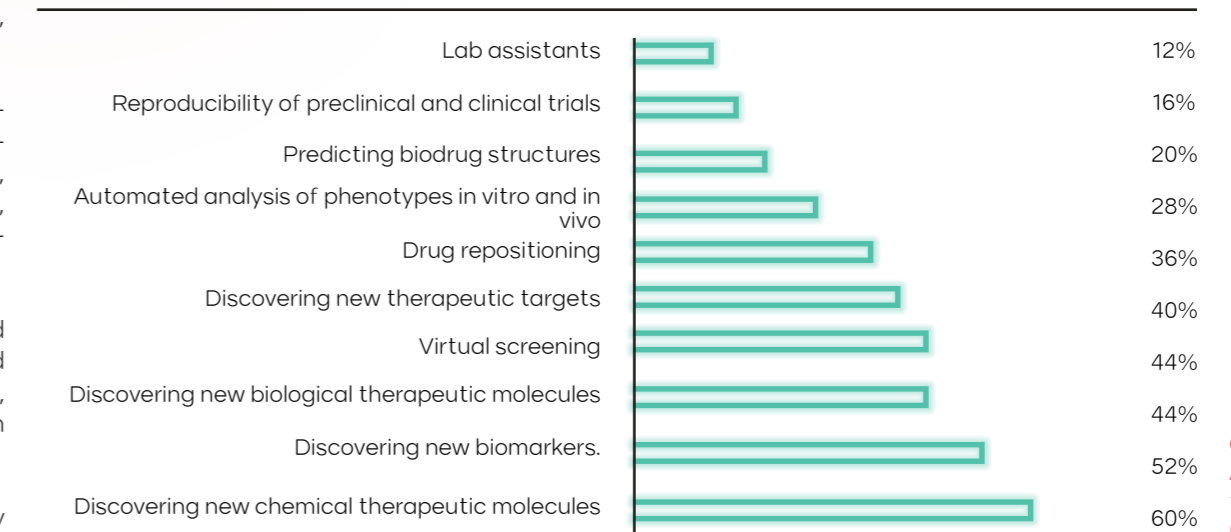
Blockchain and biorobotics are hardly used by

drug discovery companies, but are starting to be used for other processes, such as data storage, traceability and exchange, as well as functional assessment (in vivo study of cell types and functions).

IoT is being used more and more in drug discovery, especially for automating equipment control and controlling automated processes. Finally, thanks to computer science, more and more tools are being used for drug discovery, which allow us to analyse enormous amounts of information for studies, mainly using high-performance computing.

Graph 8.4 shows which drug discovery processes biotechnology companies are using digital tools for.

First, with 60%, is discovering new chemical therapeutic molecules, followed by discovering new biomarkers, with 52%. Then comes discovering new biological therapeutic molecules and virtual screening, with 44% each. The processes digital tools are used for least often are reproducibility of preclinical and clinical trials, with 16%, and laboratory assistants, with 12%.



GRAPH 8.4. Application of digital tools to drug discovery processes.



Turning medical images into actions with AI

The breakneck speed of change in the field of medical imaging and digitalisation has brought us invaluable information that helps improve medical results and improve diagnosis, treatment and monitoring of patients. One of the main restrictions to making the most of this information has been a lack of resources to turn data from the images into assessments that can be put into specific action. Quibim is tackling this critical limitation by developing solutions like QP-Discovery®, a platform that manages, indexes, stores, harmonises and analyses data from medical images. The platform also ties these images to other clinical data of interest to the physician. Since it was launched to market in 2021, more than 125 sites around the world have started using the platforms. Quibim stands out from other companies that only apply artificial intelligence (AI) to medical imaging, as it focuses on developing and manufacturing medical devices that make it easier to extract indicators from images, improving specialists' ability to assess the situation.

Quibim's success is based on three basic elements: data, technology and collaborations.

Data is the foundation of Quibim's operations. The company compiles all relevant clinical information to generate new knowledge and work on new imaging biomarkers. Access to the most suitable data to train, test and assess AI-based models is a key limitation in the field. Quibim has been very successful in tackling this, thanks to its projects with research groups and top pharmaceutical companies.

Quibim has developed its own technology to deal with the variability in the images acquired, harmonising them and ensuring the analyses are reproducible and consistent. This technology also allows for segmentation by organ and injury. The process also ensures selection of the most solid radiomic features for developing predictive models with AI. The final step is understanding and explaining how the model makes decisions, which is necessary to build trust, detect errors and biases, and make the model more reliable. This technology sets

Quibim apart from the competition.

Working on the cutting-edge of AI and collaborating with academia, pharmaceutical companies and large European consortia, Quibim actively promotes, sponsors and leads its own research projects to generate scientific evidence and advance the field of radiomics.

This focus has led to QP-Prostate®, an analysis solution for MRI images of the prostate based on AI that integrates into PACS systems. QP-Prostate®, with regulatory authorisations in the EU and United States, automates tasks and provides radiologists with precise quantitative information to improve and standardise decision-making.

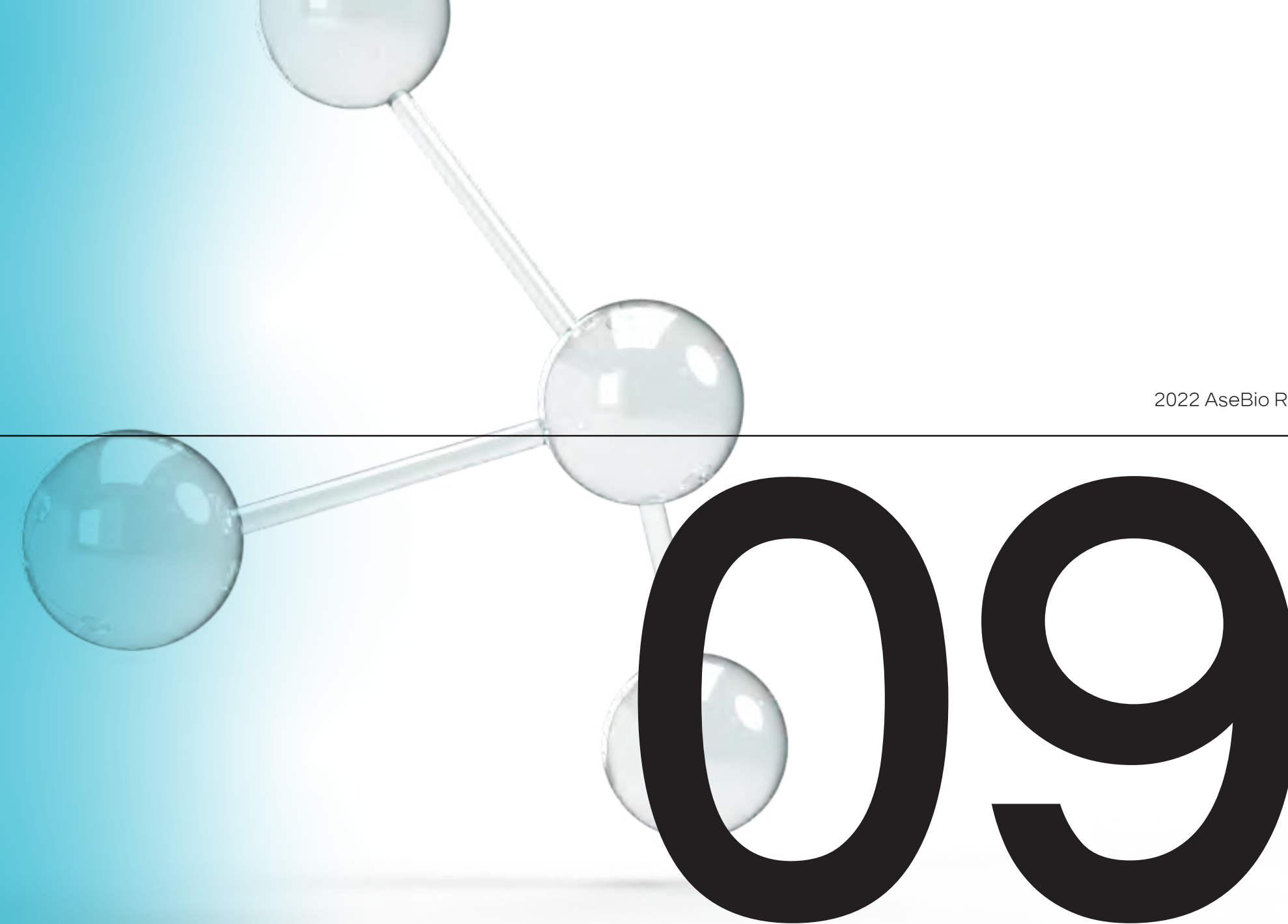
But QP-Prostate® is just the beginning. Quibim is turning data into prognoses and those prognoses into specific actions, unlocking the underlying potential of huge imaging datasets. Plus, it is developing algorithms and medical devices that can turn this information into actionable predictions.

Ángel Alberich-Bayarri
CEO



IMPACT

2022 AseBio Report



09

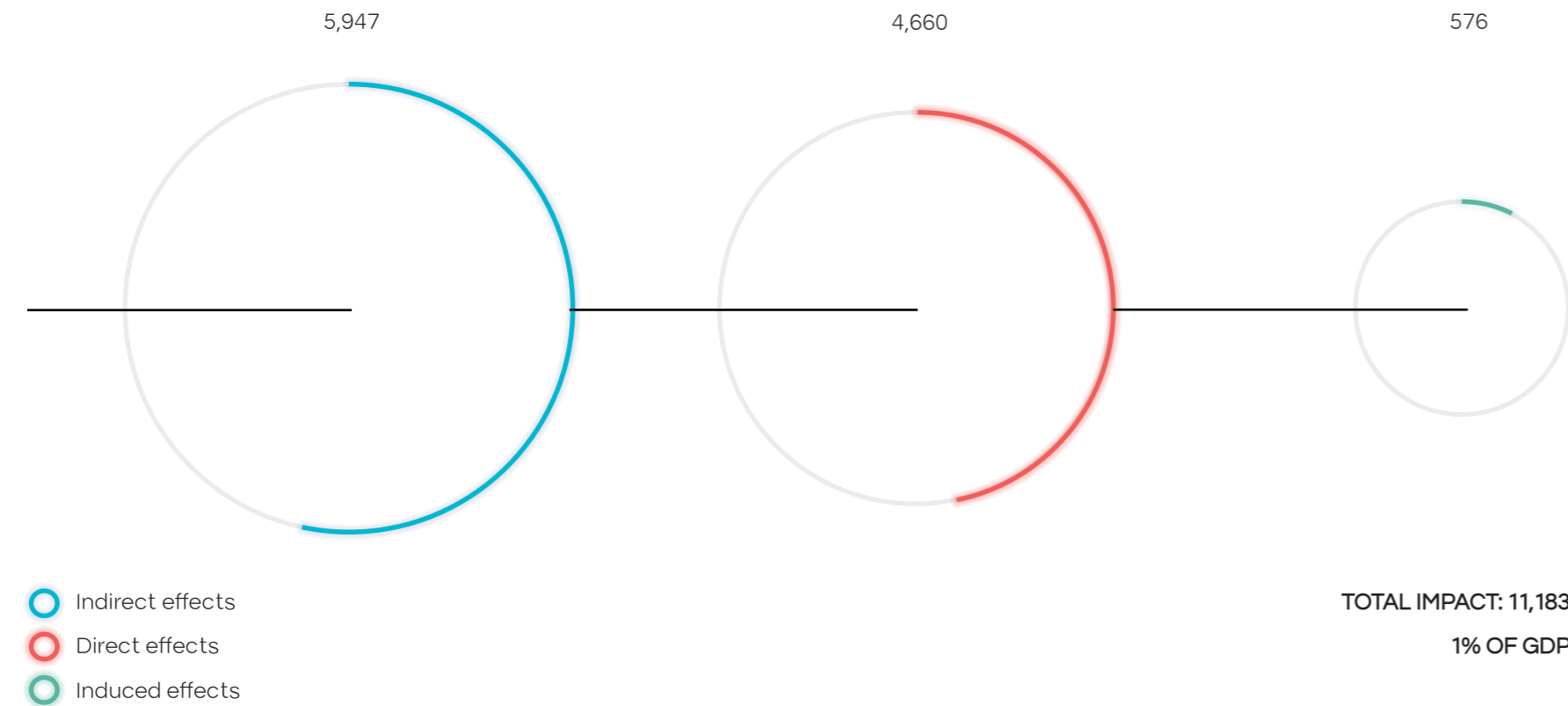
9.1 ECONOMIC IMPACT

IMPACT ON GDP:

THE CONTRIBUTION OF BIOTECH FIRMS TO THE GDP IS NOW 1%

The joint total of direct, indirect and induced effects of the activity of biotech firms throughout the production chain gave us their joint impact on the total gross domestic product (GDP).

In 2021, the activities of biotech firms generated more than €11 billion in income, roughly 1% of the national total, mainly through indirect effects caused by flows of intermediary goods and services (graph 9.1).



GRAPH 9.1. Impact of biotech companies on the GDP (€ millions of 2021 GDP) Source: Compiled internally from the information on companies collected by AseBio.

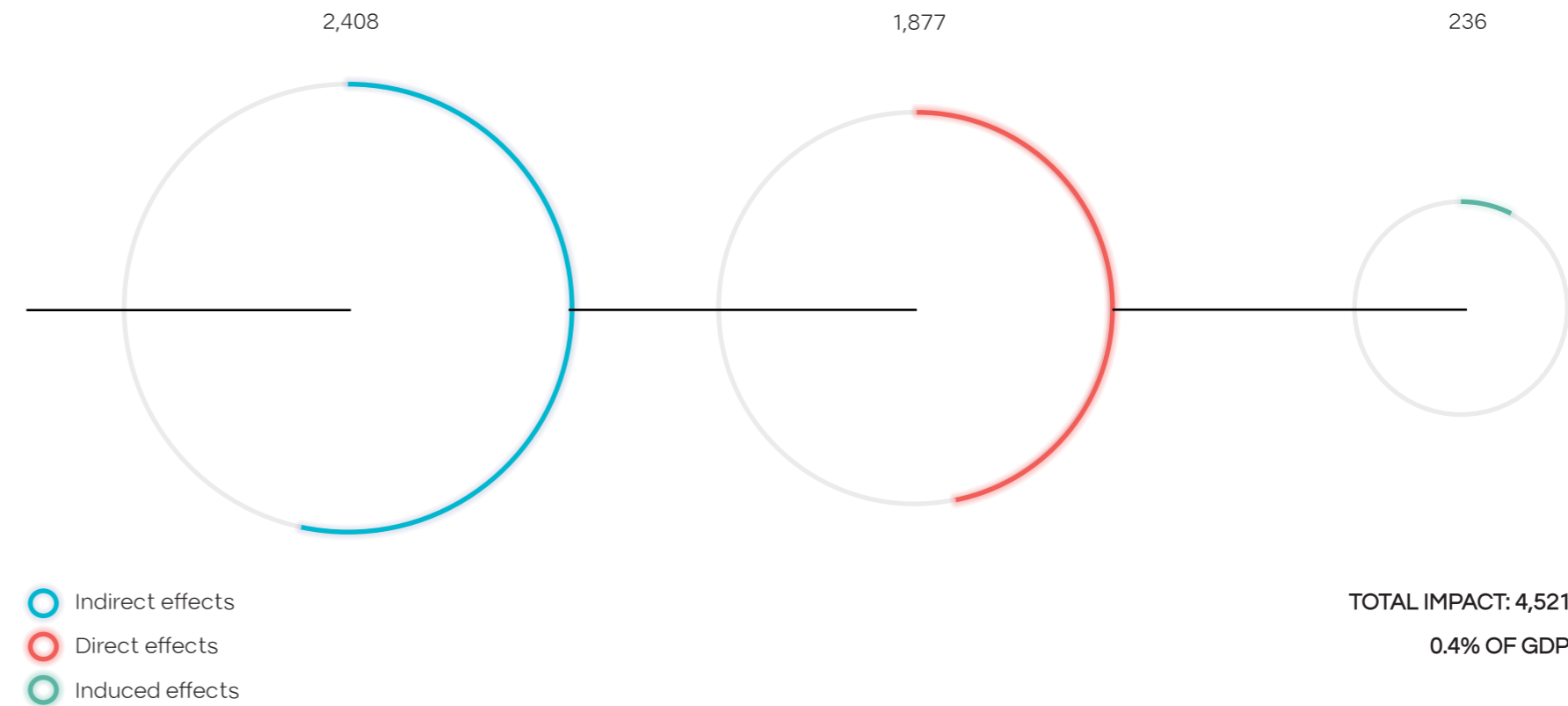
- Indirect effects
- Direct effects
- Induced effects

CONTRIBUTION TO THE WELFARE STATE

BIOTECH FIRMS CONTRIBUTE 0.4% OF THE GDP IN STATE TAXES

In 2021, the total impact on tax revenue of biotechnology companies was €4.5 billion. This estimate is based on the various income flows generated by the activity of biotechnology companies and the average tax rate for each type of income. This accounts for 0.4% of the GDP (graph 9.2).

Of this total tax revenue, one third is from social security contributions, another third from indirect taxes (VAT and other taxes) and the rest from direct taxes on personal income (IRPF) and business income (corporate tax).



GRAPH 9.2. Impact of total tax revenue from biotech companies (€ millions of 2021 tax revenue). Source: Compiled internally from the information on companies collected by AseBio.

- Indirect effects
- Direct effects
- Induced effects

TOTAL PRODUCTION OF BIOTECH FIRMS

THE JOINT TURNOVER FOR BIOTECH COMPANIES WAS 1.1% OF THE GDP IN 2021

In 2021, biotech firms saw turnover rise nearly 8%, to more than €13 billion, which is 1.1% of the GDP.

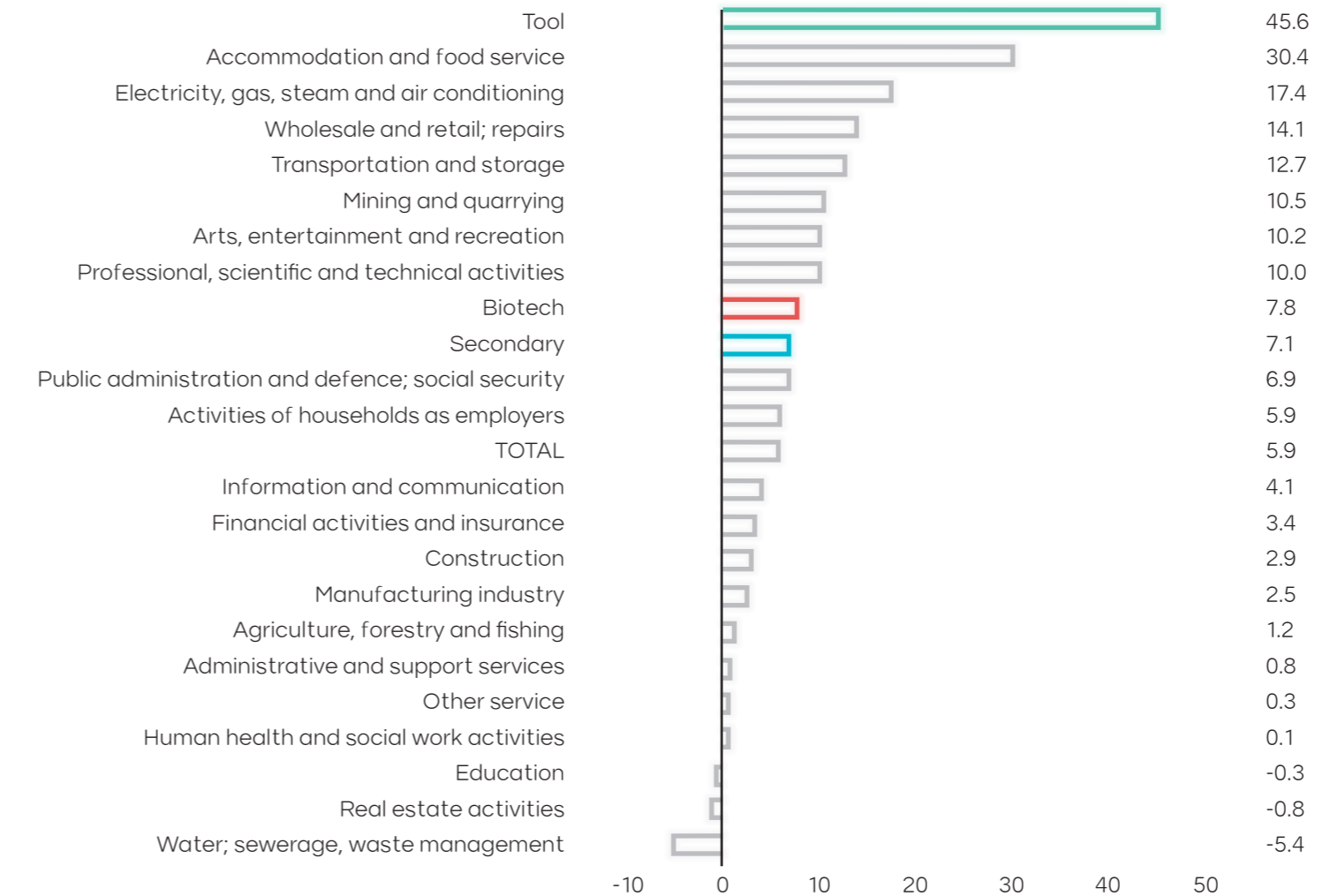
To generate this turnover, the companies had to acquire intermediary goods valued at more than €8.3 billion, which generated roughly €4.66 billion in income. Of this income, nearly €2.2 billion went to employee compensation and €2.5 billion was gross operating surplus and net taxes. Plus, total employment in these biotech firms rose 10% to over 34,000 jobs, making up 0.17% of total employment (table 9.1).

		2021	2020	2019	2018	2017	2016	2015	2014	2013
€ millions	€ millions	13,038	12,089	11,914	9,861	9,315	8,787	8,777	7,664	6,368
	% growth	7.8%	1.5%	20.8%	5.9%	6.0%	0.1%	14.5%	20.4%	-9.6%
	% GDP	1.1%	1.1%	1.0%	0.8%	0.8%	0.8%	0.8%	0.7%	0.6%
Intermediate goods		8,378	8,301	8,174	7,230	6,433	6,592	6,907	5,952	5,040
Gross value added		4,660	3,788	3,740	2,631	2,882	2,195	1,870	1,712	1,328
Employee salaries	€ millions	2,198	1,987	1,878	1,759	1,515	1,330	1,244	1,096	875
Gross operating surplus		2,462	1,801	1,862	872	1,368	866	626	616	453
Employment	Number of people	34,388	31,287	29,512	27,085	25,029	22,637	21,504	19,120	15,129
	% growth	9.9%	6.0%	9.0%	8.2%	10.6%	5.3%	12.5%	26.4%	-8.1%
	Total %	0.17%	0.16%	0.15%	0.14%	0.13%	0.12%	0.12%	0.11%	0.09%

BIOTECH FIRMS BOOST PRODUCTION 7.8%

In 2021, production in most areas of activity showed significant recovery after the crisis triggered by the pandemic. This also drove up the production growth rate to nearly 6%.

The biotechnology sector increased production in 2021. Specifically, companies that use biotechnology as a production tool increased 45.6%, biotech firms 7.8%, and companies with biotechnology as a secondary activity 7.1% (graph 9.3).



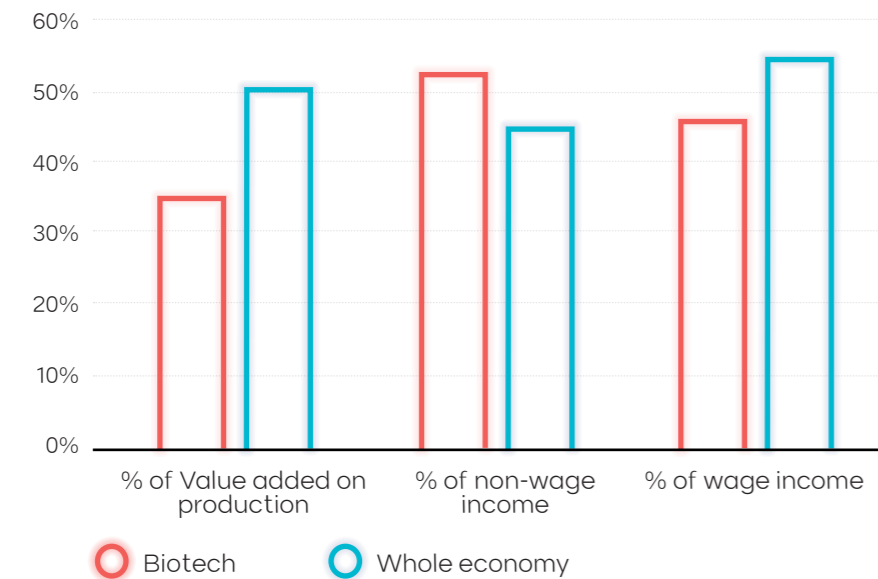
GRAPH 9.3. Comparative activity dynamics of biotechnology firms (Production growth rate for 2021). Source: Compiled from a sample of companies collected by AseBio and the Survey on Biotechnology Use. INE.

PRODUCTIVITY AND SALARIES

PRODUCTIVITY PER EMPLOYEE AT BIOTECH FIRMS IS TRIPLE THE NATIONAL AVERAGE AND SALARY PER EMPLOYEE IS NEARLY DOUBLE THE NATIONAL AVERAGE

As we noted in the chapter on talent and diversity (graph 3.4), average productivity per employee is three times higher than the Spanish national average and the average salary per employee is nearly double the national average.

However, the percentage of income generated (% of value added) relative to production for biotechnology companies is slightly lower than the national average.

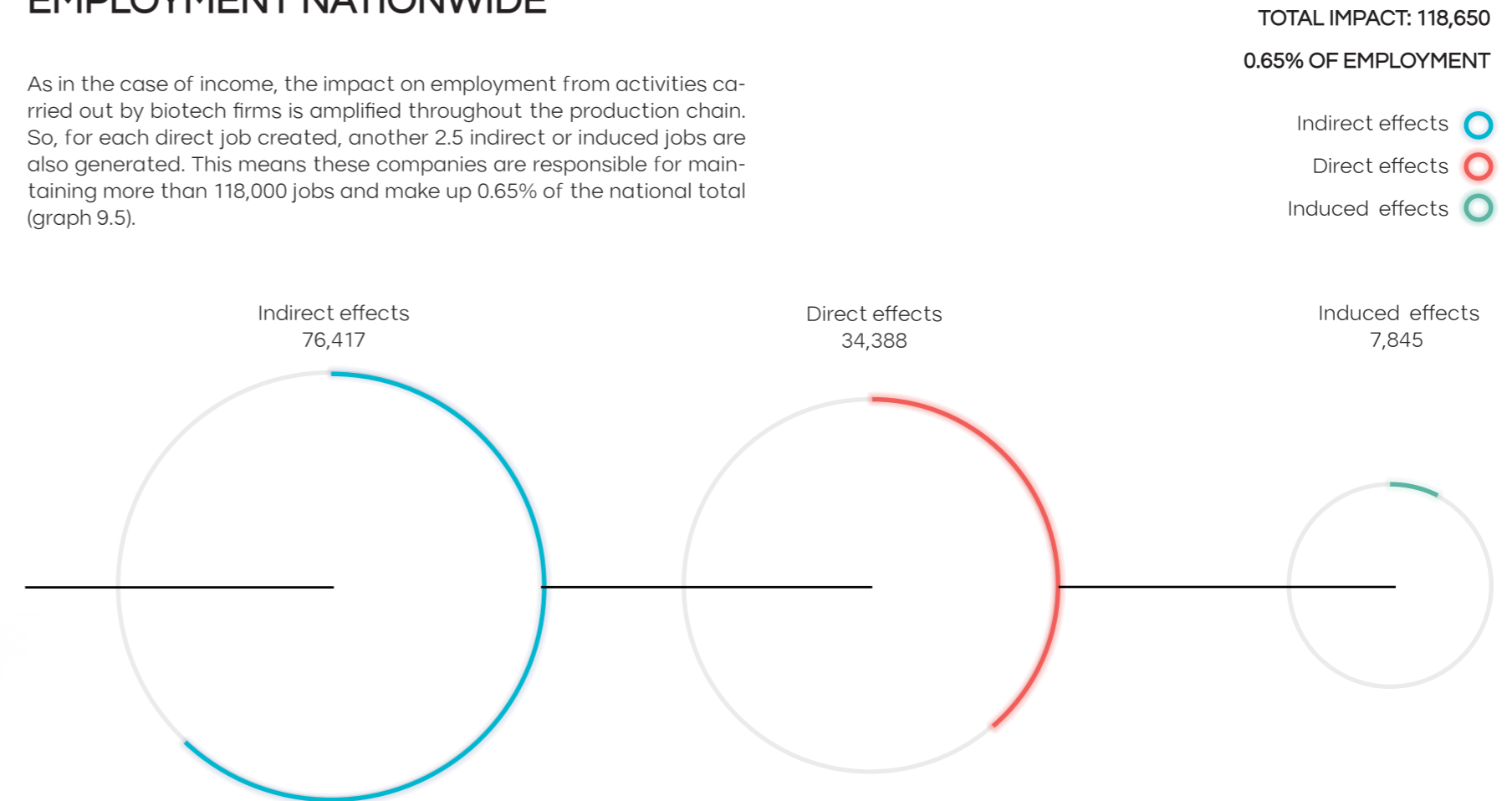


GRAPH 9.4. Basic productivity ratios for biotech firms and the whole economy. Source: Compiled from the information on companies collected by AseBio. 2021.

9.2 IMPACT ON EMPLOYMENT

SPANISH BIOTECH COMPANIES CREATE 118,000 JOBS, 0.65% OF TOTAL EMPLOYMENT NATIONWIDE

As in the case of income, the impact on employment from activities carried out by biotech firms is amplified throughout the production chain. So, for each direct job created, another 2.5 indirect or induced jobs are also generated. This means these companies are responsible for maintaining more than 118,000 jobs and make up 0.65% of the national total (graph 9.5).



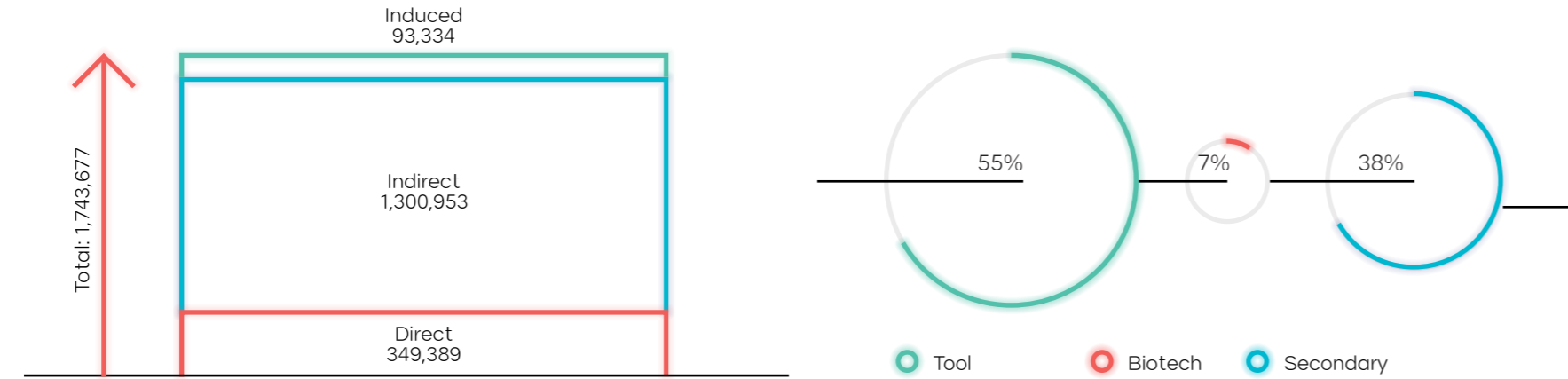
GRAPH 9.5. Impact on total employment of biotech firms (Total jobs in 2021). Source: Compiled from a sample of companies collected by AseBio and the Survey on Biotechnology Use. INE.

If we broaden our analysis to look at all companies doing biotechnology activities, the total employment that directly or indirectly depends on the activities carried out by these companies is more than 1,300,000 jobs, or 9.5% of the national total (graph 9.6).

Breaking these figures down, 75% of these are indirect effects from the consumption of intermediary goods and services and investments made by biotechnology companies and another 20% are direct effects.

By type of company, biotech firms account for 7% of this impact, while those with biotechnology as a secondary activity contribute 38% and those that use biotechnology as a production tool, the remaining 55%.

GRAPH 9.6. Total contribution to employment by companies with biotechnology activity (Total jobs in 2021). Source: Compiled from a sample of companies collected by AseBio and the Survey on Biotechnology Use. INE.



The evolution of total employment tied to companies that carry out biotechnology activities was particularly favourable in 2021, with average growth of 22%, meaning over 64,000 new jobs. Therefore, the total volume of direct employment at companies with biotechnology activities in 2021 was nearly 350,000 (graph 9.7).

This vigorous growth in employment boosted the percentage of biotechnology companies relative to total employment from 1.7% in 2020 to 1.9% in 2021.



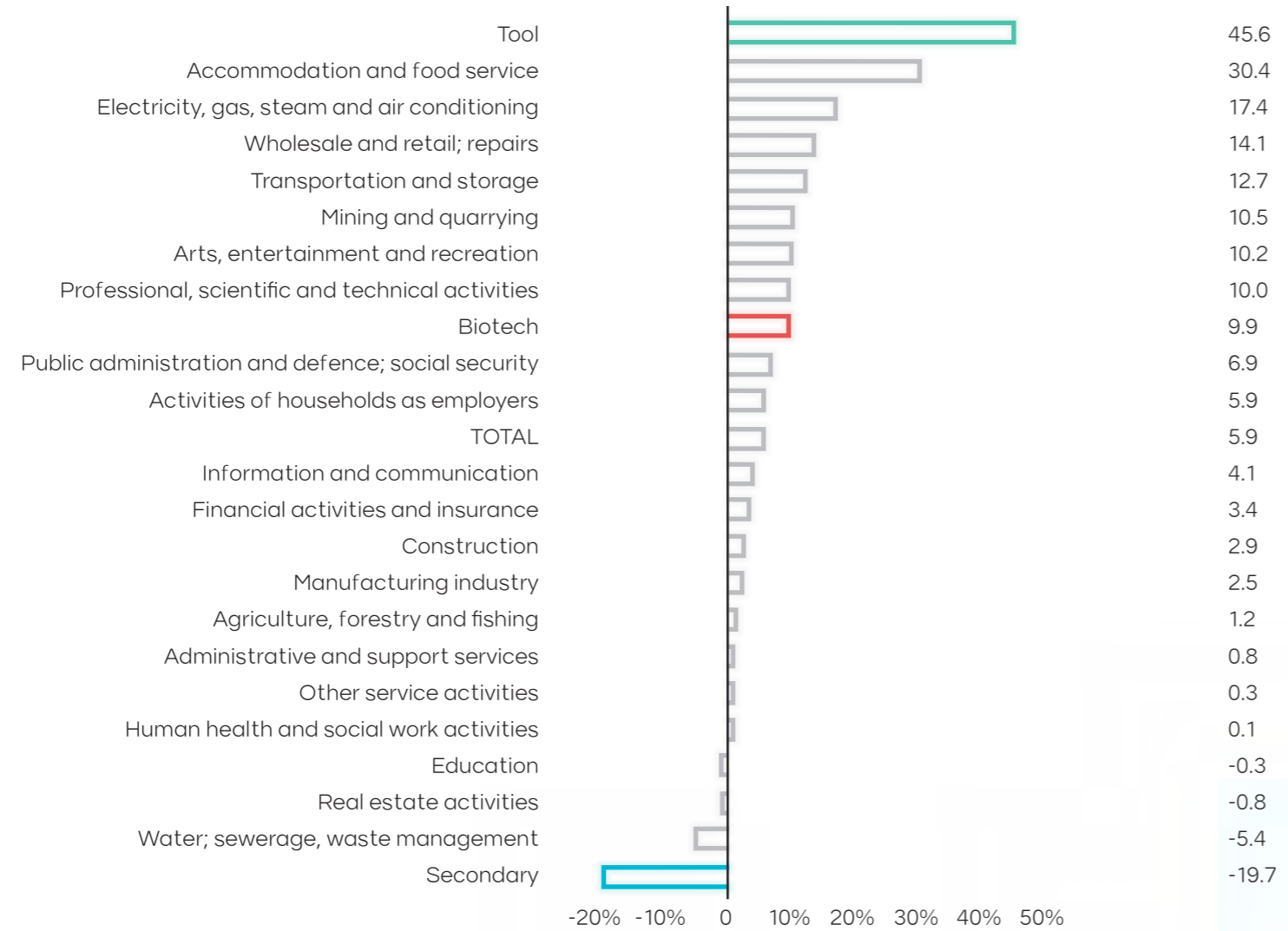
GRAPH 9.7. Evolution of employment in biotechnology companies. Source: Compiled from a sample of companies collected by AseBio and the Survey on Biotechnology Use. INE.



In terms of employment growth rates in the various branches of activity, biotech firms, with 9.9%, are above the national average (5.9%)

Furthermore, companies that use biotechnology as a production tool grew 45.6% and those with biotechnology as a secondary activity, 19.7% (graph 9.8). As we've seen in previous editions of the AseBio Report, this sort of marked variations have occurred before, which could be due to companies self-identifying as belonging to different categories each year.

GRAPH 9.8.
Comparative employment growth dynamics of companies with biotechnology activity (Employment growth rates 2021). Source: Compiled from a sample of companies collected by AseBio and the Survey on Biotechnology Use.





DEEP TECH REVOLUTION IN BIOTECHNOLOGY: REVEALING THE SECRETS OF THE FUTURE OF RESEARCH

On the cutting-edge of biotechnology innovation, Promega Corporation is a benchmark in employing the powerful combination of deep tech and product development.

The company strategically adopts technologies based on artificial intelligence and big data analytics to drive important advances in biomedical research and diagnostics.

Some examples of this are the bioassays developed to measure the biological activity of a compound in its physiological state, the optimisation of therapeutic monoclonal antibodies to treat various oncological conditions, the discovery and optimisation of drugs and the optimisation of gene-editing techniques like CRISPR.

Promega contributes to the development of high-performance platforms to produce and characterise monoclonal antibodies by analysing huge amounts of data and identifying patterns. This allows for personalised therapies that adapt to the genetic traits of each patient, opening up new possibilities for treating rare or hereditary genetic diseases, where the individual is a crucial factor.

One example of this is Lynch syndrome, a hereditary genetic mutation that increases the risk of developing several types of cancer. Analysing this mutation makes it possible to direct patients' treatment and apply immunological therapies when suitable.

This approach is also used to develop molecular diagnostic systems that can quickly and precisely detect infectious and oncological diseases, which facilitates precise diagnosis and early treatment, which is more effective than slower, more costly traditional approaches that make it more difficult to make decisions with the desired speed.

The instruments we manufacture contain cloud-linked analysis software to make it easier for lab technicians and clinical analysts to work remotely.

In the drug discovery arena, Promega uses deep tech to speed up and optimise the development of new medicines. The company uses machine learning algorithms to optimise design of tracers that can then be used in trials on intracellular molecular interaction. In this regard,

the ability to visualise and model molecules in 3D also makes it possible to study the interaction between compounds and their intracellular target and the most suitable design to assess the biological activity of compounds with unprecedented precision.

Making CRISPR-Cas9 gene-editing techniques more efficient is also possible thanks to this new technology, which simplifies the genetic engineering processes needed in biomedical research to precisely quantify the genetic modifications made with this technique and predict the potential off-target outcomes of the editing.

In short, Promega Corporation has set itself apart as a leader in the use of deep tech to develop biotechnology products to improve people's health and wellbeing, by providing tools that facilitate a better understanding of biological processes and paving the road for a healthier, more sustainable future.



Gijs J. Jochems, PhD
General Manager

WHO'S WHO



2022 AseBio Report

BOARD OF DIRECTORS

CHAIRWOMAN - MERCK



▲ Ana Polanco

1st VP - INGENASA



▲ Belén Barreiro

2nd VP - ARRAYS FOR CELL NANODEVICES



▲ Elena Rivas

3P BIOPHARMACEUTICALS



▲ Dámaso Molero

ABBVIE



▲ Antonio Bañares

ABILITY PHARMA



▲ Carles Domenech

3rd VP - ZECLINICS



▲ Javier Terriente

ADL BIOPHARMA



▲ Ignacio Urbeiz

AMADIX



▲ Rocío Arroyo

AMGEN



▲ Fina Lladós

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ATRY'S HEALTH



✔ Santiago de Torres

BAYER HISPANIA



✔ Richard Borreani

LEITAT



✔ Francesc Mitjans

PHARMAMAR



✔ Belén Sopesén

SCIENCE & INNOVATION LINK OFFICE



✔ Antonio López

VIVEBIOTECH



✔ Gurutz Linazasoro

MSD



✔ Cristina Nadal

NIMGENETICS



✔ Enrique Samper

ORYZON GENOMICS



✔ Carlos Buesa

HEALTHCARE COMMITTEE



► Fina Lladós - AMGEN

GOALS

- To influence regulatory processes that affect the application of biotechnology in healthcare
- To help develop and improve the national health system, promoting access to biotechnological innovation that is compatible with system sustainability
- To raise awareness of the contributions biotechnology makes to healthcare and further recognition as a sector that generates a lot of value added
- To lead collaboration and partnership initiatives with stakeholders in the public and private sectors that foster innovation in healthcare and new technology and public policies that valorise R&D throughout the chain

WORKGROUPS

- **Market access**
Coordinator: Laura Pellisé (Amgen)
- **Personalised medicine and advanced diagnostics**
Coordinator: Rocío Arroyo (Amadix)

- **Drug discovery**
Coordinator: Javier Terriente (ZeClinics)
- **Advanced therapies**
Coordinator: Gurutz Linazasoro (ViveBiotech)
- **Antibiotic resistance**
Coordinator: Cristina Nadal (MSD)

FUNDING AND TECHNOLOGY TRANSFORMATION COMMITTEE



► Enrique Samper - NIMGenetics

GOALS

- To carry out actions to bring about a framework of incentives that encourages R&D
- To reinforce the positioning of specialised venture capital as a key tool for funding the creation, development and growth of innovative biotech companies.
- To help develop a connection between biotechnology and new technologies
- To contribute, alongside other social and institutional stakeholders, to achieving the goals on the 2030 Agenda
- To promote a regulatory framework based on ethical and bioethical needs to ensure safety

WORKGROUPS

- **Funding R&D and business development**
Coordinator: Carmen Eibe (PharmaMar)
- **Biotechnology and new technology**
Coordinator: Elisa Díaz (Merck)

- **Venture capital**
Coordinator: Clara Campàs (Asabys Partners)

AGRIFOOD COMMITTEE



► Richard Borreani (Bayer Hispania)

GOALS

- To promote an appropriate, stable regulatory framework in Spain and Europe that can facilitate the contributions of biotechnology to agrifood production and environmental conservation
- To continue putting agrifood biotechnology on the agenda of public institutions and governments, encouraging measures to promote and support the sector
- To boost visibility and recognition of biotechnology for agrifood and the role it plays in ensuring safe, sustainable, quality nutrition
- To raise awareness of and communicate the positive impact biotechnology has on land use, food security and better nutrition, water management and preserving ecosystems, offering up solutions to our planet's sustainability challenges in line with the 17 Sustainable Development Goals on the 2030 Agenda

WORKGROUPS

- **Sustainable agriculture and healthy eating**
Coordinator: Richard Borreani (Bayer Hispania)

INDUSTRIAL TRANSFORMATION COMMITTEE



GOALS

- To influence the regulatory and political arenas to drive research and innovation, aid for industrial biotechnology and its presence in national and international projects
- To put in place measures that drive and strengthen Spanish biotech so it will be recognised as a hub of knowledge and high technology, as it is in the most advanced countries around us
- To support internationalisation of industrial services companies, helping them break into the global market

WORKGROUPS

- **Bioeconomy, circular economy and industrial sustainability**

TALENT AND COMMUNICATION COMMITTEE



▼ Elena Rivas - A4Cell

GOALS

- To encourage members to get involved in communicating biotechnology in the association's daily endeavours
- To consolidate collaborations among members to amplify and anchor the sector's messages, building a community
- To reflect on a variety of new communication and dissemination methods to call attention to the value of biotechnology
- To generate a framework for actions to encourage, attract and retain talent
- To boost partnering with the university arena and dissemination of biotechnology through universities
- To help valorise diversity and inclusion, particularly gender equality

WORKGROUPS

- **Communication and social impact**
Coordinator: Beatriz Díaz (Zendal)

- **Talent, entrepreneurship and diversity**

Coordinator: Tomás Alarcón
(3P Biopharmaceuticals)



3P BIOPHARMACEUTICALS



ABBVIE



ABILITY PHARMACEUTICALS



ACCURE THERAPEUTICS



ALGENEX



ALIRA HEALTH



ALLINKY BIOPHARMA



ALMIRALL



ACKERMANN INTERNATIONAL



ADL BIOPHARMA



ADM BIOPOLIS



ADMIT THERAPEUTICS



ALTA LIFE SCIENCE



ALTUM SEQUENCING



AMADIX



AMGEN



ADNTRO



AFFIRMA BIOTECH



ABT AGAROSE BEAD TECHNOLOGIES



AGRENVEC



AMS BIOPHARMA LABORATORY



ANQUOR CORPORATE FINANCE



ANTARES CONSULTING



APTATARGETS



AKRN CONSULTING



ALCALIBER



ALCHEMIT HEALTH (BIMAXPRO)



ALGAENERGY



APTUS BIOTECH



AQUILÓN CYL



ARACLON BIOTECH



ARCHIVEL FARMA

 **ARQUIMEA**

ARQUIMEA GROUP

 **a4cell**
nanodevices

ARRAYS FOR CELL NANODEVICES

 **ARTHEX**
biotech

ARTHEX BIOTECH

 **artinvet**
Innovative Therapies

ARTINVET

 **hest**
medical diet
Laboratory

BEST MEDICAL DIET

 **betaScreen**

BETASCREEN

Bexen medical

BEXEN MEDICAL

 **biobide**

BIOBIDE (BBD BIOPHENIX)

 **asabys**

ASABYS PARTNERS

 **ASCIL**
BIOPHARM

ASCIL BIOPHARM

 **ams lab**

AMS LAB

 **iic**
instituto
de ingeniería
del conocimiento

ASOCIACIÓN PARA EL
DESARROLLO DE LA INGENIERÍA DEL CONOCIMIENTO
(ADIC)

 **BioClonal**

BIOCLONAL

 **BIOCROSMO**

BIOCROSMO

 **biocross**

BIOCROSS

 **BIOFABRI**

BIOFABRI

 **ASPHALION**
Knowledge from experience

ASPHALION

 **AstraZeneca**

ASTRAZENECA

 **atrys**

ATRYS HEALTH

 **ayming**

AYMING

 **Biohope**

BIOHOPE SCIENTIFIC
SOLUTIONS FOR HUMAN
HEALTH

 **bioingenium**

BIOINGENIUM

 **BIOLAN**
accurate · easy · smart

BIOLAN

 **BIOLAN**
HEALTH

BIOLAN HEALTH

 **Azur**
Global Nutrition

AZUR GLOBAL NUTRITION
EUROPE

 **BAYER**

BAYER HISPANIA

 **bcnhealth**

BCN HEALTH

 **bdi**

BDI BIOTECH

 **biomar**
MICROBIAL TECHNOLOGIES

BIOMAR MICROBIAL
TECHNOLOGIES

 **BIOMARIN**

BIOMARIN

 **BIONAT**

BIONAT HEALTH

 **bionet**

BIONET INGENIERÍA

BUSINESS MEMBERS



BIOREPOS



BIORIZON BIOTECH



BIOSEARCH LIFE



BIOSERENTIA



CELLDRIVE 3D



CELLUS



CELTARYS BIOTECH



CESIF



BIOSFER TESLAB



BIOTECHNOLOGY ASSETS



BIOTECHVANA



BIOTOOLS



CIMERA (CELLAB)



COOL CHAIN LOGISTICS



CORIFY CARE



CRAZY SCIENCE & BUSINESS



BRISTOL MYERS SQUIBB



BTI BIOTECHNOLOGY INSTITUTE



CAIXA CAPITAL RISC



CAPITAL CELL



CRB INVERBIO



CULTIPLY



DINAMIZA



DIOMUNE



CARTHAGENETICS



CEISA SOLUTIONS



CELAVISTA MITO-BIOGENESIS



CELGENE INSTITUTE OF TRANSLATIONAL RESEARCH EUROPE



DISIT BIOTECH



DIVERSA TECHNOLOGIES



DOBECURE



DR. HEALTHCARE

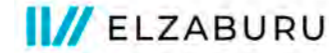
BUSINESS MEMBERS



DREAMGENICS



DSM



ELZABURU



ENZYMLOGIC



GRADOCELL



GRIFOLS



GRIFOLS ENGINEERING



GRUPO BME



EUROGENETICS



EURONEXT



EUROPEAN RESEARCH BIOLOGICAL CENTER (ERBC)



FERRER



GSK (GLAXOSMITHKLINE)



HEALTH IN CODE



HELIIX BIOINFORMATICS SOLUTIONS



HIGHLIGHT THERAPEUTICS



FLOMICS BIOTECH



GATE2BRAIN



GEISTEK PHARMA



GÉNESIS BIOMED



HISTOCELL



HOFFMANN EITLE



ILLUMINA



IMERETI



GENETRACER BIOTECH



GENINCODE



GENIOS Y TALENTOS



GILEAD



IMMUNOSTEP



INGENASA



INGULADOS RESEARCH



INHIBITEC ANTICUERPOS



INNOQUA TOXICOLOGY CONSULTANTS



INNOUP FARMA



INSTITUTO EMPRESARIAL DE BIOTECNOLOGÍA



INTEGRA THERAPEUTICS



LABORATORIOS LETI



LABORATORIOS RUBIÓ



LAMINAR PHARMA



LENTISTEM BIOTECH



INVEREADY



INVIVO CAPITAL PARTNERS



IOMED MEDICAL SOLUTIONS



ISERN PATENTES Y MARCAS



LEUKOS BIOTECH



LIBERA BIO



LIFE LENGTH



LIFESEQUENCING



IUL



IXAKA IBERIA



KAUDAL CONTROL Y GESTIÓN DE PROYECTOS



KINSY



LIM GLOBAL



LIMNOPHARMA



LONZA



MABXIENCE



KLINIA INGENIERÍA FARMACÉUTICA



KONEXIO BIOTECH



LABGENETICS



LABLINEAL 4MEDIKS



MACROGEN INC SUCURSAL EN ESPAÑA



MASID HEADQUARTERS, S.L.



MED-IVD TECH



MERCK



MICROOMICS



MIKROBIOMIK



MILTENYI BIOTEC



MIMARK DIAGNOSTICS



NORAY BIOSCIENCES GROUP



NORAYBIO



NOSTRUM BIODISCOVERY



NOVARTIS



MINORYX THERAPEUTICS



MOA BIOTECH



MONTAJES DELSAZ



MSD



NOVO NORDISK



NOWTURE



NUCAPS NANOTECHNOLOGY



ONCOHEROES BIOSCIENCES



MULTIPLEX MOLECULAR DAIGNOSTICS (MULDIA)



NANO1HEALTH



NANOLIGENT



NATAC GROUP



ONECHAIN IMMUNOTHERAPEUTICS



ONENA MEDICINES



ONIRIA THERAPEUTICS



OPERON



NETSERIL



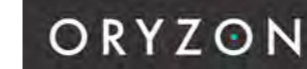
NEURAL THERAPIES



NEUROFIX



NIMGENETICS



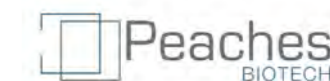
ORYZON GENOMICS



PALMEERA FARMS



PALOBIOFARMA



PEACHES BIOTECH

BUSINESS MEMBERS



PEPTOMYC



PHARMAMAR



PRASFARMA



PRODUCTLIFE GROUP



REMA B THERAPEUTICS



RETINA READ RISK



ROCHE FARMA



SANIFIT



PROGENIE MOLECULAR



PROGENIKA BIOPHARMA



PROMEGA



PROMETUM SPAIN



SANOFI



SARTORIUS STEDIM



SCIENCE & INNOVATION LINK OFFICE (SILO)



SECUGEN



PROTEOS BIOTECH



PROTOQSAR



PVPHARM



QGENOMICS



SERMES CRO



SIGMA-ALDRICH QUÍMICA



SISTEMAS GENÓMICOS



SOBI (SWEDISH ORPHAN BIOVITRUM)



QUALITECFARMA



QUIBIM



RECOG ANALYTICS



REIG JOFRÉ



SOM BIOTECH



SPECIPIG



SYLENTIS



TEBRIO

BUSINESS MEMBERS



TECBIOCEL, S.L.



TECNIC BIOPROCESS EQUIPMENT MANUFACTURING



TELUM THERAPEUTICS



TIGENIX



WHOLE GENIX



WORLD COURIER



YSIOS CAPITAL PARTNERS



ZECLINICS



THERIVA BIOLOGICS



VALTRIA



VAXDYN



VENAIR BIOTECH



ZETA



ZYMVOL BIOMODELING



VETGENOMICS



VILLA INSECT (PROTIBERIA)



VITRO



VIVEBIOTECH



VIVIA BIOTECH



VIVOTECNIA RESEARCH



VLPBIO



WERFEN



AGENCIA IDEA

ainia

AINIA



BANCO ESPAÑOL DE ALGAS



BASQUE HEALTH CLUSTER



FISEVI



CRG



FUNDACIÓ INSTITUT D'INVESTIGACIÓ SANITÀRIA ILLES BALEARS (IDISBA)



FUNDACIÓN CENER



BIOCAT



BIOFARMA



BIOGA (CLUSTER TECNOLÓGICO EMPRESARIAL DAS CIENCIAS DA VIDA)



BIOIB



FUNDACIÓN CENTRO DE TECNOLOGÍAS DE INTERACCIÓN VISUAL Y COMUNICACIONES VICOMTECH



FUNDACIÓN CIENTIFICA DE LA ASOCIACIÓN ESPAÑOLA CONTRA EL CANCER (AECC)



FUNDACIÓN GEICAM



FUNDACIÓN ESPAÑOLA DE HEMATOLOGÍA Y HEMOTERAPIA (SEHH)



BIOVAL



CENTRO DE BIOTECNOLOGÍA Y GENÓMICA DE PLANTAS



CICYTEX



CIBER



FUNDACIÓN IMDEA ALIMENTACIÓN



FUNDACIÓN MEDINA



FUNDACIÓN PARA EL FOMENTO DE LA INVESTIGACIÓN SANITARIA Y BIOMÉDICA DE LA COMUNITAT VALENCIANA – FISABIO



FUNDACIÓN PÚBLICA ANDALUZA PARA LA INVESTIGACIÓN EN BIOMEDICINA Y SALUD (FIMABIS)



CNIO



CSIC



FEDERACIÓN ASEM



FIBAO



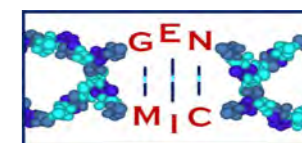
FUNDACIÓN PROGRESO Y SALUD



FUNDACIÓN TECNALIA RESEARCH & INNOVATION



FUNDACIÓN TEÓFILO HERNANDO



GENMIC



GOBIERNO DE LA RIOJA.
DG INNOVACIÓN



IGTP



IMIBIC



IBIS



PROYECTO CLAMBER



PTS GRANADA



SEBBM



SENC



IISFJD



INSTITUTO I+12



IIS LA FE



ISCIII



SEOM



SODENA



UNIVERSIDAD ALFONSO X
EL SABIO



UNIVERSIDAD CEU SAN
PABLO



INSTITUTO PARA LA
COMPETITIVIDAD EMPRE-
SARIAL (ICE)



IQS



IRB BARCELONA



LEITAT



UNIVERSIDAD EUROPEA
DE MADRID



UNIVERSIDAD DE NAVARRA



UNIVERSIDAD MIGUEL
HERNÁNDEZ DE ELCHE
- INSTITUTO DE INVESTI-
GACIÓN, DESARROLLO E
INNOVACIÓN EN BIOTEC-
NOLOGÍA SANITARIA (IDIBE)



VETERINDUSTRIA



NEIKER



PARC CIENTÍFIC DE
BARCELONA



PARQUE CIENTÍFICO DE
MADRID



PROEXCA

METHODOLOGY

2022 AseBio Report

METHODOLOGY

CHAPTER 1 - R&D INVESTMENT

For this chapter we compiled the results of the Survey on Biotechnology Use and statistics on R&D activities from the National Statistics Institute and statistics on R&D activities from the National Statistics Institute. 2021.

https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176808&menu=resultados&idp=1254735576669

CHAPTER 2 - FUNDING

The data in chapter 2 was compiled from information from the State Research Agency (AEI), the National Innovation Company (ENISA), the Centre for the Development of Industrial Technology (CDTI), Capital Cell, members and the press.

CHAPTER 3 - TALENT AND DIVERSITY

To obtain the data on the evolution of the number of students enrolled in university studies in biotechnology, we used data from the Statistics on University Students of the Ministry of

Universities (<https://www.universidades.gob.es/clasificaciones-estadisticas-universitarias/>), and selected data since 2015 for all universities that offer undergraduate or masters studies in biotechnology.

To obtain more data on the admissions scores, we consulted the scores posted on the Educaweb website on 14 March 2023 (<https://www.educaweb.com/notas-corte/grados/ciencias-experimentales/grado-biotecnologia/>), which were provided by the public universities except for those for Andalusia, which were provided by the Regional Ministry of Education, and for Catalonia, provided by the Inter-University Council of Catalonia.

To obtain the data on number of researchers, female researchers and female representation, we used the INE 2021 Survey on Biotechnology Use and statistics on R&D activities from the National Statistics Institute.

https://www.ine.es/dyngs/INEbase/es/operacion.htm?c=Estadistica_C&cid=1254736176808&menu=ultiDatos&idp=1254735576669

For the data on the productivity and salaries of employees at biotech firms, we used the sample of companies compiled by AseBio.

The data on female participation in the biotechnology industry comes from a survey of AseBio members.

To obtain the results on women in executive teams at biotechnology companies, we used data from the Companies House registry and the websites of companies in the sector, as

well as data from the INE and the Institute of Women of the Ministry of Equality. <https://www.inmujeres.gob.es/MujerCifras/CienciaTecnologia/Empleo.html>

CHAPTER 4 - BUSINESS FABRIC

To reflect the number of biotechnology companies, and their breakdown by the field they apply biotechnology in, size and geographic location, we compiled data from the INE Survey on Biotechnology Use and the list of biotechnology companies identified by AseBio.

To put together the list of biotechnology companies started in 2021, we requested information from various entities in the main Autonomous Communities with biotechnology activity.

Plus, to put together the map of biotech-related facilities, we analysed the main Autonomous Communities.

CHAPTER 5 - ENVIRONMENTAL CONDITIONS

To find out what society thinks of science and technology, we compiled data from the Social Perception of Science and Technology in Spain survey conducted by the Spanish Foundation for Science and Technology (FECYT) in 2022.

<https://www.fecyt.es/es/noticia/encuestas-de-percepcion-social-de-la-ciencia-y-la-tecnologia-en-espana>

We also compiled data from the 2022 COTEC Survey on Social Perception of Innovation.

<https://cotec.es/observacion/encuesta-de-percepcion-social-de-la-innovacion/6a81446c-6656-94e3-5d74-f8328ce1ca0b>

The data on perception of the biotechnology sector was obtained from a survey of AseBio members, who were asked to rate several factors on how they had affected the biotechnology sector in 2022.

CHAPTER 6 - RESULTS OF THE BIOTECH SECTOR

To compile this chapter we obtained information from the following sources:

- In the section of production of scientific knowledge, we included the main indicators for Spanish scientific production in biotechnology, provided by the Spanish Foundation for Science and Technology (FECYT), based on data from the Elsevier SciVal tool, which contains the scientific production from the Scopus database.
- Normalised impact is an indicator that compares similar publications, in terms of year published, category and document type. A NI of 1.0 means the paper is cited as often as the global average. A NI of 2.0 means the paper is cited twice as often as the global average.
- To come up with the number of scientific publications by AseBio members in 2022, we requested information from members on their scientific publications in biotechnology, not including communications or posters at congresses or fairs.
- The data on patents was obtained for AseBio in a study carried out by the Madrid Science Park based on the ClarkeModet database. The information was obtained using the methodology designed by ClarkeModet and the Madrid Science Park, based on OECD definitions for the biotechnology sector. The Clarivate Analytics databases were used. Plus, we checked the public databases of the various offices: Spanish Patent and Trademark Office (OEPM), European Patent Office (EPO), United States Patent and Trademark Office (USPTO), Japan Patent Office (JPO) and the World Intellectual Property Organisation (WIPO).

- The advances in development were compiled from press publications or the websites of AseBio members.
- Both the section on products and services launched in 2022 and their breakdown by areas of activity were put together by consulting AseBio members.

CHAPTER 7 - COLLABORATION AND INTERNATIONALISATION

The results on partnerships established by biotech companies were obtained from members, checking grant resolutions in cooperation with CDTI and AEI, and by checking press releases from the various organisations.

The information on international presence of AseBio members was compiled from their websites and by consulting them directly.

CHAPTER 8 - NEW TECHNOLOGIES

To compile this information, AseBio surveyed its members between October and December 2020 and updated the information in April 2023, to find out to what extent new technologies are being developed and used in the biotechnology sector.

Plus, the section on Digital tools in drug discovery is based on a survey of members working in this area of biotechnology and personal interviews.

CHAPTER 9 - IMPACT

The data for this chapter was obtained from a sample of companies compiled by AseBio and from the Survey on Biotechnology Use conducted by the National Statistics Institute (INE).

We systematically collected and processed registry information for all companies identified as biotech firms, processing their basic financial statements, balance sheets, and profit and loss statements to get a direct measurement of their business activity.

For each of these companies, we quantified their levels of basic production (turnover), employment, intermediate goods (products and services), value added, salaries (personnel expenditure) and investment over the past 10 years (2011-2021) to get the cumulative levels for all biotech firms, extrapolating the results

obtained to the overall totals identified by the INE.

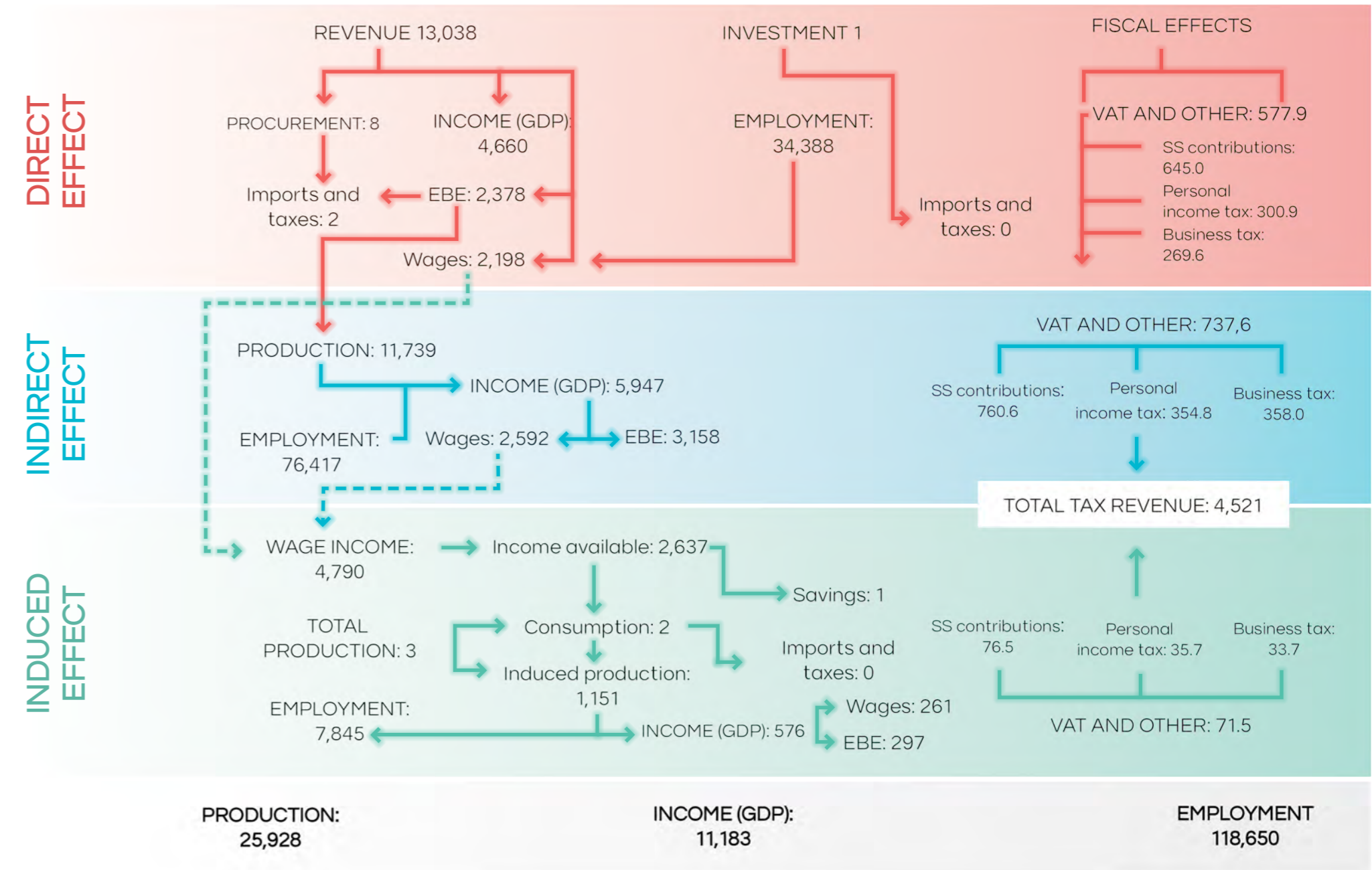
Alongside the detailed analysis of the biotech firms, we also moved forward in quantifying the corresponding levels for companies with biotechnology as a secondary activity and those that use biotechnology as a production tool, which along with biotech firms make up what we call the biotechnology sector.

For these companies, we started with the total employment figures in the INE survey and did an indirect estimation of the other benchmark levels, taking into account both the general ratios in the National Accounting and the specific ones for strictly biotechnology activities calculated previously.

From these figures, we calculated the overall economic impact of the activity carried out by these companies on the Spanish economy as a whole.

This way, using the standard methodology based on input-output tables, we calculated both the direct impact in terms of generating income (GDP), employment and tax revenue, and the indirect impact, generated by companies with biotechnology activity purchasing goods and services from companies with biotechnology activity, plus the induced impact generated by direct and indirect salaries dependent on this activity.

The following figure shows the sequence of calculations for the Impact chapter.





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