ASE BIO
Spanish Bioindustry Association

# TOWARDS SUSTAINABLE, RESILIENT GROWTH

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# ANA POLANCO

Before the beginning of 2021 we all knew, in one way or another, that we were moving into the era of biotechnology. Covid-19 vaccines, thanks to gargantuan global efforts, reached the population in record time; innovative solutions to help bring the pandemic to an end. And that they did. We worked and learned under a new collaborative model that brought innovation to people's lives much more quickly. In last year's edition of this report, we talked about record time, teamwork and the indisputable potential of science and the biotechnology industry to protect people's lives. There was no doubt that, for a more resilient, sustainable global future, we had to turn, together, to science and innovation as a driving force for economic development and social wellbeing.

The pandemic exposed our system's vulnerabilities and areas that need improvement in order to be better prepared for future emergencies, as well as for the challenges of the United Nations Sustainable Development Goals (SDG). Over these two years, we've faced the consequences of the pandemic and learned that we have to work together to tackle the challenges we share today: a climate crisis that is threatening our planet and our way of life, new challenges like antibiotic resistance and the ageing population, which has become one of the top global health priorities. Plus, now the war in Ukraine has brought to light new needs in the world to ensure the supply of food and power.

2030 is approaching and we still have a lot to do if we are going to achieve the SDGs.

This action plan, which lays out a new road map for economic growth that incorporates the people's needs without forgetting the planet's, has been a turning point in the global agenda. National and European plans like the Green Deal, the European Climate Pact, the Farm to Fork Strategy and Spain 2050 set new social, environmental and economic goals that force us, as a society, to rethink our growth model.



# CHAIRWOMAN

As you will see in this Report, biotechnology, given its innovation and production capacities, as well as its transversal nature, is essential to achieving these goals. In our country, we have a solid, dynamic industrial sector that is working to develop 'made in Spain' biologics that will make the industry more sustainable and the economy more circular. Biotechnology, which impacts 13 of the 17 SDGs, has proven its ability to respond to the need to eradicate diseases like polio, with new production processes and crops resistant to adverse climate conditions or with new solutions to cut emissions to 2,500 tonnes of $CO_2$ by 2030. And looking to the future, the European Commission has identified 100 radical innovations that will change the world, and biotechnology plays a key role in many of them, such as gene editing (with CRIPSR-Cas9 technology as the benchmark), gene therapy, bioplastics, the microbiome and genomic vaccines. And we can't forget that seven in ten drugs being developed are biotechnology therapies. The sector is ranked first in R&D investment and this allows us to make significant advances towards these goals we share as a society while also providing a new production model based on science and innovation.

Spain is the eighth world power in scientific production and our sector employs more researchers than any other, who make up 13% of those on staff at our companies. With this brilliant, diverse talent we must drive the transformation of that excellent science, which we are known for even beyond our borders, into industry with a direct impact on our daily lives. Companies will be a key player in this transfer. It is clear that we can't recover without the 862 companies that make up our innovative fabric today. As this Report reflects, these companies have achieved a new record in funding, with over €180 million secured from national and international investors; they employ more than 120,000 people in quality jobs and generated over €10.3 billion in GDP impact.

On this journey towards achieving the 2030 Agenda, we have to be in the same boat: all pulling towards sustainable, resilient growth, as the title of this report notes. And we'll get to that destination that is so necessary for our society with help from biotechnology. Because the biotechnology sector in our country is working every day to improve people's lives and make the planet more sustainable. And AseBio will continue putting in motion any initiatives necessary to stimulate the sector's growth and achieve this shared goal.

With this new edition of the AseBio Report, we want to reflect the potential of a sector that hasn't stopped growing in the past two decades and is working on solutions to build a sustainable future and truly cutting-edge health. I'm sure you'll enjoy reading it.

# ION AROCENA

# CEO

There is no question that 2021 was the year of biotechnology. Both science and industry have opened up a window to the future that has been a turning point in the history of our society. And over the course of this year, AseBio has accompanied our companies to show that working in the biotechnology sector means working to improve the lives of millions of people.

After a year of this healthcare crisis, we've shown our companies' valuable contribution to tackling the pandemic, with over 127 solutions to bring an end to SARS-CoV-2. But we've also shared the industry's position on vaccine patents, the issues in the supply chain that are affecting biotech companies and requested accelerated approval of the self-diagnostic test.

With our members, we've worked to position biotechnology in our recovery, with nine expressions of interest for recovery to promote development of biodrugs, precision medicine, advanced therapies, tools to manage future pandemics, artificial intelligence applied to health, the microalgae industry, the insect industry and revalorisation of agricultural waste. With this, we have made biotechnology a strategic sector in the PERTE for "Vanguard Health" and Spain 2050 Strategy.

We've connected our members' work with the public agenda through new narratives, like "One Health", the green transition, the blue economy and climate change. We've explained what our members are doing to drive the green transition in our country by sending out a selection of ten bioproducts from AseBio companies to four ministries and the President of Spain.

From 2021, we are the coordinators of the European Climate Pact and have shared the potential of biotechnology along with new technology like artificial intelligence and big data, and the disruptive capacity of CRISPR-Cas9 and messenger RNA.

Spain is a powerhouse in areas like advanced therapies and personalised and precision medicine, which is why we have worked to raise awareness of our capacities and requested that regulations advance in order to take advantage of this potential.

We've shown that we contribute to gender equality, with more than 60% women working in R&D, on key dates like 11 February and 8 March, providing a stage for 13 women who work in the biotechnology industry in Spain. Plus, we've encouraged talent in our sector by taking part in several job fairs.

We've also worked to improve regulations and the biotechnology ecosystem with our fiscal and economic proposal and with our proposal on the Start-ups Law.

In collaboration with the OECD and the European Commission, we've also presented our proposals to drive public-private collaboration in our country's R&D system.

In 2021, we also hosted our benchmark international event in Navarra, BIOSPAIN, bringing together over 1,000 people from nearly 600 organisations in 30 countries and connecting them in over 2,000 one-to-one meetings.

But we've also launched new initiatives.

In 2021, we kicked off our workgroup on venture capital with eight fund managers specialising in the life sciences to position them as a key instrument for the sector's growth. We've also launched the Horizon Scanning instrument, which groups together the sector's capacities and anticipated therapeutic developments. And to finish off, we launched a Training Plan for members in areas of interest they had identified.

2021 was the year of biotechnology and a year of impact for AseBio, when thanks to all of you we were able to hit a record 284 members, stand even closer to society and have a greater influence.

Now we have to look to the future, towards new challenges marked by a new sustainable, resilient growth model where we have the shared responsibility to build cutting-edge health and promote the planet's sustainability.

We're counting on you to keep pushing biotechnology forward in our country!

# CONTENTS

# INTRODUCTION

The 2021 AseBio Report, considered the benchmark publication in the biotechnology sector since 2000, is published annually by the Spanish Bioindustry Association to provide a snapshot of the biotechnology sector in Spain. 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.

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. Continuing on from the 2020 AseBio Report, this time we have analysed how biotechnology contributes to 13 of the 17 Sustainable Development Goals.

This Report is mainly geared towards those who, for their personal or professional interest (businesspeople, public officials, legislators, professionals at financial institutions, media outlets, scientists and bioentrepreneurs, among others), would like a clear snapshot of biotechnology in Spain.

## Content

The 2021 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 2021 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 representation 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 science and innovation and how the biotechnology sector perceives its environment.
7. Results (chapter 6): includes scientific publications, what the sector has patented, the main advances and products and services launched to market.
8. Collaboration and Internationalisation (chapter 7): we include the alliances established in the sector in 2021 and international markets companies have moved into.
9. Impact (chapter 8): analyses the biotechnology sector's impact on the economy and employment. There is also a section on how AseBio members are working to achieve the Sustainable Development Goals (SDG).
10. Who's who: features information on members of the AseBio Board of Directors, Work Committees and members.
11. Methodology: explains the methodology used to compile the 2021 AseBio Report.

## Thanks

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 Bayer Hispania, Biorizon Biotech, CBGP, CENER, ICEX, IQS, LEITAT, MiMARK, Novartis, LEITAT, Madrid Science Park Foundation, Promega Biotech and Sanofi.

• 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 2021.

• All the organisations that helped identify companies established in 2021.

• The State Research Agency (AEI), the Centre for the Development of Industrial Technology (CDTI), the National Innovation Company (ENISA) and the Spanish Venture Capital and Private Equity Association (ASCRI) for their collaboration on the chapter on funding.

# EXECUTIVE SUMMARY

## R&D INVESTMENT

**The biotechnology sector invested €900 million in 2020.**

In 2020, the biotechnology sector invested nearly €900 million in R&D, 67% from biotech companies.

This investment comes 70% from the companies' own funds and nearly half goes to pay researchers and technicians.

Biotech firms reduced their investment in R&D for the first time by 10% due to the pandemic and healthcare crisis. Nevertheless, the sector remains first in R&D investment, after R&D services and the educational sector.

## FUNDING

**The biotech sector hit a new record in 2021, attracting over €180 million.**

In 2021, there was a new record in the grand total of funding secured by the biotech sector. The joint total was over €180 million in 41 operations in 2021. Plus, international investors continue to show their interest in the Spanish sector, taking part in many of the biggest operations.

Crowdfunding continues to be 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) and the State Research Agency (AEI) remained practically unchanged.



## TALENT AND DIVERSITY

**The sector with the highest percentage of researchers and a leader in employing female researchers.**

The sector continues to interest young students, with more than 8,700 students enrolled in university studies in biotechnology last year, 60% 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 13.23% of all employees.

On the ranking of women working in R&D as a percentage of total R&D staff, biotech companies remained in third, with 59%, and on the ranking of female R&D workers as a percentage of all employees they still lead with 15.45% of the total. Women still only make up 30.2% of executive teams at biotech firms, although this is well above the average of 23.2% for IBEX-35 companies.

## BUSINESS FABRIC

**Nearly 4,000 companies carried out biotechnology activities in 2020, of which 862 are biotech firms.**

In 2020, the rate of growth remained high, although somewhat lower than the previous year, with a 9% increase in the number of companies.

The sector is comprised of 3,910 companies. Of this total, 862 are strictly biotechnology firms.

Among companies working exclusively in biotechnology, 47% focus on human health, 42% on food applications, 17% on agriculture and forestry production, 15.8% on animal health and aquaculture, 10.8% on the environment and 10.6% on industry. Plus, 53% are micro-SMEs and 43%, SMEs.

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

## ENVIRONMENTAL CONDITIONS

**The positive perception of Spanish innovation dropped, but is up compared to other European countries.**

75% of those surveyed believe innovation is a positive thing. Although low, this is still above pre-pandemic rates. Likewise, the perception of our country's level of innovation compared to countries around us improved. While 50.4% of those surveyed in 2020 put innovation from Spain among the least advanced countries in the EU, in 2021 this percentage dropped to 45%.

AseBio members perceive public opinion of biotechnology as very positive to their work. Plus, their rating of the biotech industrial fabric has risen, although the economic situation is still seen as a barrier.

## RESULTS

**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 2.8% of global production and is cited 30% more than the global average in this area. Spain holds on to its eighth-place global ranking in number of papers in biotechnology. Spanish biotechnology produces science of excellence, with 24.2% of papers among the top 10% most cited in the world.

The biotech sector is protecting its innovations more and more internationally, mainly through the European Patent Office (39%) and PCT patents (38%).

Companies launched 20% more products and services to market, many of them associated with Covid-19.



## COLLABORATION AND INTERNATIONALISATION

**The sector collaborates with public entities and other biotech firms and internationalises in European countries.**

Biotech firms forged 220 partnerships, half of which were with entities in the public sector and nearly all the remaining half with other biotech companies. Plus, 51% of these deals were with international organisations and 62% were for research and development.

AseBio members boosted their international presence 20% in 2021, with 39 member companies present in 51 countries on all continents. Countries in Europe are the main choice for biotechnology companies when establishing subsidiaries and the United States is the country with the most subsidiaries.

## IMPACT

**The economic impact of the sector on the GDP and employment is growing.**

The joint activity of biotech companies generated over €10.3 billion in income, which is 0.9% of the Spanish GDP, and they saw nearly €12 billion in turnover, or 1.1% of the GDP. Plus, they contribute roughly €4.04 billion in taxes, 0.4% of the GDP, and 121,755 jobs, which is 0.7% of national employment.

The sector is one of the few to see an increase in production growth, with biotech firms up 1.5%.

Biotechnology has a direct impact on our planet and society, and is part of 13 of the 17 Sustainable Development Goals.

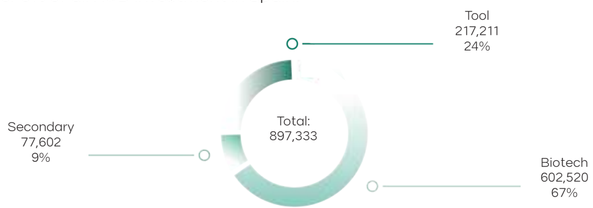
# R&D INVESTMENT

01

## Biotechnology companies invested €900 million in R&D in 2020, 6% of all R&D investment in Spain.

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 nearly €900 million in R&D in 2020 (graph 1.1), which was just under 6% of all R&D investment in Spain.

Biotech firms, compared to secondary companies and businesses that use it as a tool in their processes, remained at the core of this investment, accounting for two thirds of all R&D investment.




Graph 1.1. Breakdown of companies' R&D investment in biotechnology. Source: INE. Survey on Biotechnology Use 2020.

## This R&D investment comes 70% from the companies' own funds and nearly half goes to pay researchers and technicians.

R&D investment in the biotechnology business sector goes mainly to operating expenses, which is 91% of all spending. Of these operating expenses, 33% goes to paying researchers and 17% to paying technicians and assistants. The remaining 41%, goes to other operating expenses. The data is practically identical for biotech firms: 32% goes to paying researchers, 16% to technicians and assistants, and 41% to operating expenses.

Regarding capital expenses, which make up roughly 9% of the total, the majority (6% of the total) goes to acquiring equipment and instruments.

R&D investment by biotechnology companies comes mainly from their own funds, which continue to be their main source of resources, making up nearly 70% of the total (table 1.1). This is followed by funds from other countries at 13%, funds from the Public Administration at 9% and, finally, funds from the business sector at 7%.



| | Biotech firms | Secondary | Tool | Biotechnology total |
|---|---|---|---|---|
| **Internal R&D expenditure in biotechnology** | **602,520** | **77,602** | **217,211** | **897,333** |
| A) By nature of the expenditure | | | | |
| Operating expenses | 541,269 | 71,986 | 204,154 | 817,409 |
| Paying researchers | 194,401 | 32,922 | 68,382 | 295,705 |
| Paying technicians and assistants | 98,937 | 11,856 | 46,060 | 156,853 |
| Other operating expenses | 247,931 | 27,209 | 89,712 | 364,852 |
| Capital expenditures | 61,251 | 5,616 | 13,058 | 79,924 |
| Land and buildings | 8,482 | 898 | 892 | 10,272 |
| Equipment and instruments | 41,244 | 4,323 | 11,043 | 56,609 |
| Acquisition of specific R&D software | 4,254 | 109 | 476 | 4,839 |
| Other intellectual property products specifically for R&D | 7,271 | 286 | 647 | 8,203 |
| | | | | |
| B) By source of funds | | | | |
| Internal funds | 418,567 | 47,014 | 147,516 | 613,097 |
| Funds from the business sector | 44,282 | 10,409 | 31,395 | 86,085 |
| Funds from the public administration sector | 56,901 | 11,393 | 23,846 | 92,140 |
| Funds from the higher education sector | 519 | 0 | 335 | 853 |
| Funds from private non-profit institutions | 1,965 | 0 | 2,717 | 4,682 |
| Funds from the rest of the world | 80,287 | 8,786 | 11,403 | 100,476 |

Table 1.1 R&D investment in 2020 by type of expenditure and origin of funds (€ thousands). Source: INE. Survey on Biotechnology Use.

# Towards a sustainable transformation

2021 was once again dominated by the coronavirus pandemic and, like so many others all over the world, at Bayer we have grieved colleagues lost to Covid-19. The pandemic has been very hard on many industries and, in our case, it is key that we continue reliably supplying patients, farmers and consumers all over the world with what in some cases are essential products.

We have moved into a decisive decade for achieving the United Nations Sustainable Development Goals (SDG). If we have learned anything from 2021 it is the urgency of transitioning towards a sustainable economy and society, and at Bayer we have advanced in this direction, fully aware that our contribution is crucial to achieving our vision of "Health and food for all". We are helping achieve those global challenges through our activities and our products. We are helping sustainably improve agriculture and access to food and medical care, which improves people's lives.

The economy continued to grow last year in many parts of the world. At the same time, so did global emissions, revealing the dilemma we are facing. At Bayer, we saw dynamic growth in 2021 while also cutting our emissions. Through our Carbon Initiative, we are working to reduce and sustainably offset carbon dioxide emissions in the agricultural supply chain. This is an important sign.

Never before has innovation in agriculture been so important, as it is key in tackling the challenges the global food and healthcare systems are facing. At Bayer, we are committed to providing better solutions for all farmers, consumers, patients and our planet, which is why we invest in research and development in various areas, including plant breeding and cell and gene therapy.

Plant breeding gives farmers crops that adapt better to their environment and consumer preferences using the natural genetic diversity in each crop family.



Some plants adapt better to certain climates and are more resistant to changing environmental conditions, giving them a better chance at survival, which means more productive crops. Plants can also be bred for better quality and a better fit with consumers' tastes, which helps cut food loss and waste.

Cell and gene therapies are one of the first steps in the evolution of drug development. They target the root cause of the disease and are geared towards preventing, treating and potentially curing. This doesn't only apply to rare genetic conditions, but also to more common diseases like immune disorders, cancer and degenerative diseases.

Our goal is to further broaden our long-term innovation strategy and development portfolio by investing in this area. We focus on induced pluripotent stem cells (iPSC), gene therapy with adeno-associated viruses (AAV) and oncological cell therapies and gene editing.

In line with the United Nations Sustainable Development Goals (SDG), we've set ambitious goals and want to work effectively towards achieving them progressively.

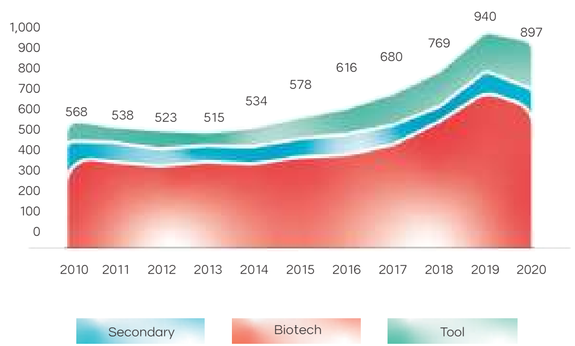
Bayer Crop Science

**The impact of the healthcare crisis led to a drop in R&D investment by biotech firms in 2020.**

2020 wasn't a particularly favourable year for biotechnology research. For the first time since 2017, there was a year-on-year drop in R&D investment of nearly 5%. This drop was more pronounced among biotech firms, which saw R&D investment fall 10%, while companies that use biotechnology as a production tool saw a significant increase in R&D investment over 2019.

These results may be a clear effect of the pandemic and the healthcare emergency, when although many biotechnology companies continued their activity and others pivoted, many also reported being affected by delayed or even stopped clinical trials. Given the level of investment required to conduct clinical trials and their weight in the total R&D activities of biotech firms, delayed or stopped studies considerably decreased R&D investment in biotechnology companies.

Nevertheless, as we'll see in the next section, biotech firms continue to lead the ranking of R&D investment.

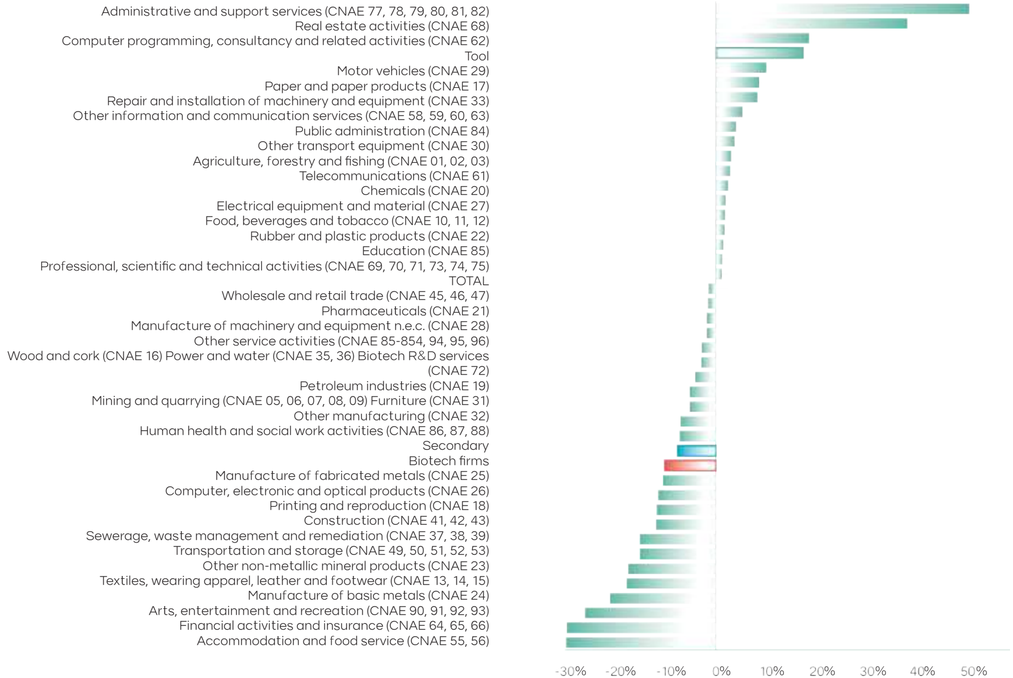



Graph 1.2. Evolution of internal R&D expenditure (€ millions) 2010-2020. 2020. Source: INE. Survey on Biotechnology Use.



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 significantly less. This is consistent with what AseBio member companies reported in 2020 regarding the delays they were experiencing with their clinical research projects.

It is worth noting the significant increase in R&D carried out by companies that use biotechnology as a production tool, with one of the highest rates.



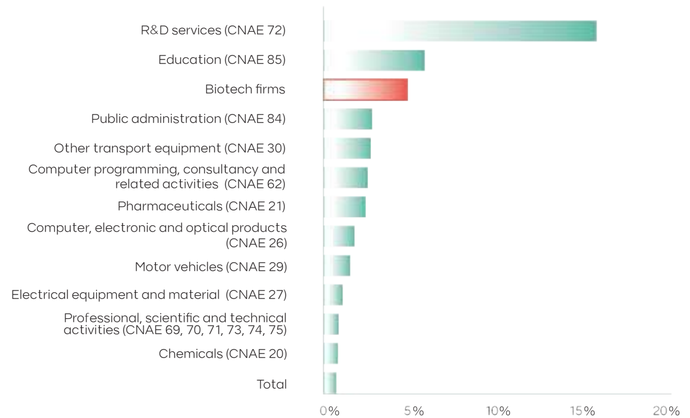

Graph 1.3. Growth in R&D expenditure in 2020 (Year-on-year growth rate). Source: Compiled internally from the 2020 INE Survey on Biotechnology Use and INE Statistics on R&D activities.



**Despite the decrease, biotech still invests more in R&D than any other industrial sector.**

The economic shutdown of 2020 due to the pandemic and the lockdown measures to stop its spread had a clear impact on the global dynamics of R&D investment.

Nevertheless, strictly biotechnology companies were still first in spending compared to production, only surpassed by R&D services and education (graph 1.4).




Graph 1.4. R&D investment intensity in 2020. (Percentage of production). Source: Compiled internally from the 2020 INE Survey on Biotechnology Use and INE Statistics on R&D activities.

# Promoting health and wellbeing through innovation

ORYZON

SUSTAINABLE DEVELOPMENT GOALS

3 GOOD HEALTH AND WELL-BEING

Oryzon is a leading biopharmaceutical company in clinical development and epigenetics. Oryzon has an advanced pipeline, with two LSD1 enzyme inhibitors, iadademstat and vafidemstat, in phase II clinical trials for oncology and neurological diseases, some drugs with the potential to be registered, and more early-stage programmes for other epigenetic targets.

The company has also developed a powerful platform to identify biomarkers and validate targets for a variety of oncology and neurological diseases.

Aware of the important contribution the biotech sector is making to the Sustainable Development Goals (SDG) set by the United Nations and the role biotechnology plays in improving the lives of millions,

Oryzon is developing therapies for diseases with important unmet medical needs, joining forces to work towards SDG 3, ensuring healthy lives and promoting wellbeing for all at all ages. At Oryzon we are also firmly committed to orphan and rare diseases that, given their very low prevalence, get less attention from big pharma. Four of the six clinical programmes at Oryzon are targeting these diseases, including acute myeloid leukaemia (AML), small-cell lung cancer (SCLC), neuroendocrine tumours and certain childhood neurodevelopmental disorders. So, our drug iadademstat has already been granted orphan drug designation by the United States Food and Drug Administration (FDA) and the European Medicines Agency (EMA) for AML and SCLC.

Oryzon's approach to clinical development is twofold, conducting both clinical studies with a classical approach, like our phase IIb studies currently under way with vafidemstat (EVOLUTION to treat patients with schizophrenia and PORTICO for patients with borderline personality disorder), and studies with a personalised medicine approach in genetically established subpopulations of patients with certain diseases, spearheaded by our new HOPE trial with patients with Kabuki syndrome, a disorder caused by mutations in the KMT2D/MLL2 gene found in one in 32,000 children that affects multiple organ systems, indulging the neurological, immune, auditory and cardiac systems. We are also exploring its potential in other mutations that cause pathologies related to certain types of autism.

Sonia Gutiérrez, Chief of Clinical Operations

Similarly, in cancer, with our new FRIDA study on iadademstat to treat AML patients with specific mutations in the FLT3 gene, a mutation that affects 30% of AML patients and has a very adverse prognosis.

Oryzon strives to improve health, living conditions and integration into society for people affected by these conditions with high mortality rates or debilitating consequences like cognitive deficiencies or behavioural alterations. To do so, Oryzon also collaborates with benchmark centres and institutions in these diseases, both in Spain and abroad, including the Johns Hopkins Kennedy Krieger Institute in Baltimore, the Institute of Medical and Molecular Genetics (INGEMM) at La Paz University Hospital in Madrid, and Vall d'Hebron Hospital in Barcelona.

For over 350 years, at Merck our goal has been to achieve sustainable human progress and we work every day to help people lead longer, better lives while ensuring the health of our planet. All the actions promoted through our three business lines (Healthcare, Life Science and Electronics) are aligned with the United Nations 2030 Agenda for Sustainable Development, the European Green Deal and the EU strategy to become climate-neutral by 2050. And this is because sustainability is woven into all our actions, as there is no other way. So, by 2030, we will achieve human progress for over a billion people through science and technology and integrate sustainability throughout our value chain. And by 2040, we will be climate neutral and further reduce our consumption of resources.

As a leading company in science and technology with a strong focus on health, we are working towards the Sustainable Development Goals (SDG), particularly SDG 3: ensuring healthy lives and promoting wellbeing for all at all ages.

This is why we are committed to bringing sustainability to all levels and throughout the value chain for our medications: from research and development through production, supply and transport to making our drugs accessible to those who need them.

In research and development, we bolster innovation to contribute to the sustainability of the healthcare system, and do so by transitioning from the traditional "one-size-fits-all" model to individualised prevention and treatment strategies.
In addition to increasing a therapy's chances of success, we're helping facilitate decision-making for healthcare professionals, saving time and resources in the healthcare system.

We research and develop biomarkers and targeted therapies in immuno-oncology, oncology and immunology to provide a personalised response to high-impact pathologies, such as multiple sclerosis, colorectal cancer, head and neck cancer and bladder cancer, and are working to beat the demographic challenge of the low birth rate in Spain and Europe with our fertility treatments.

Furthermore, in the field of pharmaceutical research, we are working on a project to identify the chemical synthesis pathways for new pharmacological substances that use less resources than conventional solutions.

In terms of production, we believe it is our duty to not only conserve resources in developing our products, but also to help our clients make theirs more sustainable.
To do so, we seek to reduce any negative impact our drugs may have on the environment during development, manufacturing, transport, use and disposal, and work to keep improving environmental compatibility throughout the value chain.
In pharmaceutical production and development, we've established a strategy of eco-toxicology testing that involves identifying the environmental properties of drug candidates at the beginning of development. The goal is to use this knowledge to prevent emissions into the air and water.

Furthermore, we want to limit any wasted raw materials and curb the impact of our waste-disposal practices on the ecosystems. We systematically monitor the environmental footprint of our waste-disposal activities, examining our production processes to identify areas that need improvement. In fact, we have a 'Zero Landfill' initiative at our biotechnology site in Tres Cantos, which has reduced the waste generated by 12% and will see that 100% of our waste is recycled. In energy, we are firmly committed to renewables: all of our plants in Spain use power from 100% renewable energy sources, which means our industrial activity generates zero $CO_2$ emissions.

In supplying our medications, we are also innovating in containers and packaging, always seeking the utmost sustainability. For example, our Slim Packs have made us the first company in the country to make fertility products more sustainable. This container is 40% smaller so it takes up less space in clinical refrigerators and patients' homes, cutting our carbon footprint by 33%. Plus, it is 100% recyclable and prevents 180 tonnes of plastic waste each year.

We know that transport is also key to sustainability, so since 2019 we have been working on an important transformation in this line. As part of the "Spezzatino" initiative, we are reducing greenhouse gas emissions by shipping our products by sea instead of air whenever possible.

We set the goal of transporting less than 10% of our healthcare products by air by 2023, cutting our annual $CO_2$ emissions by 10,000 metric tonnes. We've been achieving that goal since late 2021, having structurally reduced our transport-related emissions by 10,000 metric tonnes of $CO_2$.

Plus, through innovation in science and technology, in line with SDG 3, we are also helping make less-fortunate communities healthier in low- and middle-income countries. We're doing this by applying SDG 17, joining forces to advance more quickly. For example, one of Merck's priority areas is controlling and eliminating schistosomiasis through innovation in science and technology.

We work closely with the World Health Organisation on its programme to eradicate schistosomiasis. Since 2007, Merck has donated 1.5 billion doses to treat more than 600 million schoolchildren in 47 countries. The Lancet confirmed in December that the prevalence of this neglected tropical disease dropped 60% between 2000 and 2019. So, we believe we are on the right track to eliminate it completely as a public health issue by 2030.

In essence, as you can see, the more than 60,000 individuals that make up Merck around the world share one common goal: to have a positive impact on people's lives and the planet with our day-to-day work.

Miguel Fernández Alcalde, General Manager, Merck Spain

# FUNDING

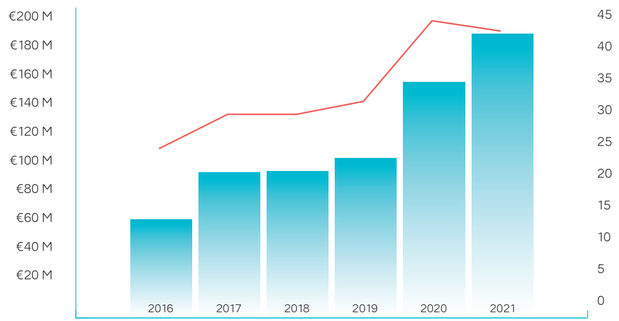
02

# 2.1 Private funding instruments

**The biotech sector hit a new record in 2021, attracting over €180 million.**

Marked by the pandemic and its impact on the economy, 2020 surprised us with 50% year-on-year growth in private capital secured, with a total of over €150 million. However, 2021 surpassed the record set in 2020, with over €180 million in capital secured through 41 private operations.

This is a 20% increase in total volume over 2020.




| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Number of operations | 26 | 29 | 29 | 32 | 42 | 41 |
| Total volume | €63,489,000 | €93,764,444 | 94,514,567 | €103,315,800 | €152,066,000 | €183,049,067 |
| Average operation volume | €2,441,885 | €3,233,257 | 3,259,123 | €3,228,619 | €3,620,619 | €4,464,611 |

Graph 2.1 Evolution of private capital operations. Source: AseBio.



The biggest operation of 2021 was Splicebio, with €50 million. The company works in advanced therapies, specifically gene therapy based on technology developed at the Princeton University. The capital increase was led by Spanish fund Ysios Capital and Belgian fund UCB Ventures. Plus, this new round also included Asabys Partners, US fund New Enterprise Associates (NEA), Gilde Healthcare, of the Netherlands; and Novartis Venture Fund, the venture capital fund from Novartis that specialises in companies developing new therapies.

Additionally, in 2021 there were four operations over €10 million each. These companies were: Imidomics with €14,750,000 and four US investors: DNS Capital, Bristols Myers Squibb, The Pritzker Organization and TAO Capital; Universal DX with €14 million; ADL Biopharma, with €12 million and Kartesia as the sole investor; and Biorizon Biotech with €10,050,000 from family offices and Moira Capital Partners.

The Biorizon Biotech capital increase was also one of the largest operations of any biotechnology company in a non-health field, as they work in innovation for agriculture.

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 2 years, paying out €4.4 million in 2019, €23 million in 2020 and €12 million in 2021. In terms of the amount pledged, in 2019 it was €19.2 million; in 2020, €15.8 million; and in 2021, €20.1 million, for a total of €55.2 million pledged over these three years.

Table 2.1. Private capital increases in Spanish biotechnology companies in 2021. Source: AseBio.

| Company | Participating investors | Instrument | Total investment volume pledged (euros) |
|---|---|---|---|
| Splicebio | Ysios Capital / UCB Ventures / Asabys Partners / New Enterprise Associates (NEA) / Gilde Healthcare / Novartis Venture Fund | Capital increase | 50,000,000 |
| Imidomics | DNS Capital / Bristol Myers Squibb / The Pritzker Organization / TAO Capital | Capital increase | 14,750,000 |
| Universal DX | Private investors | Capital increase | 14,000,000 |
| ADL BioPharma | Kartesia | Capital increase | 12,000,000 |
| Biorizon Biotech | Moira Capital Partners / Family Office | Capital increase and share premium | 10,050,000 |
| Peptomyc | Aurora Science / Alta Life Sciences / HealthEquity / CDTI Innvierte / Business Angels | Convertible participation loan | 8,680,000 |
| Biotechnology Development For Industry | Inveready | Capital increase and convertible bond | 6,600,000 |
| Medlumics | Asabys Partners / VI Partners Swiss Innovation / CDTI Innvierte / Andera Partners / Caixa Capital Risc / Innogest Capital / Kurma Partners | Capital increase | 6,000,000 |
| Integra Therapeutics | Invivo Ventures / Advent France Biotechnology / Takeda Ventures | Capital increase | 4,500,000 |
| Oncoheroes Biosciences | The Gregory Foundation for Cancer Research / Rally Foundation Inc. / Pediatric Cancer Research Foundation / Jeff Gordon Children's Foundation / Children's Cancer Research Fund / The Swifty Foundation / Arms Wide Open Childhood Cancer Foundation / Fundación Olivares / The Scott Carter Foundation / The Andrew McDonough B+ Foundation | Private investment through Simple Agreement For Future Equity (SAFE) or convertible note. | 4,300,000 |
| ADL BioPharma | Kartesia | Convertible loan | 4,000,000 |
| Arthex Biotech | Invivo Ventures / AdBio Partners | Capital increase | 3,500,000 |
| Atlas Molecular Pharma | Inveready / CDTI Innvierte | Capital increase | 3,000,000 |
| SOM Biotech | Santi 1990 / Anangu Grup | Participation loan | 2,000,000 |
| Telomere Therapeutics | Invivo Ventures / CDTI Innvierte | Capital increase | 1,890,000 |

| Company | Participating investors | Instrument | Total investment volume pledged (euros) |
|---|---|---|---|
| Aelix Therapeutics | Ysios Capital / Caixa Capital Risc / CDTI Inniverte | Convertible loan | 1,858,000 |
| Biohope | Non-institutional investors | Capital increase | 1,756,212 |
| Algenex | Current investors | Capital increase | 1,600,021 |
| MOA Foodtech | Clave / Viscofan / Banco Sabadell / Big Idea Ventures / Eatable Adventures | Capital increase | 1,400,000 |
| A4Cell | BeAble Capital / CDTI Innvierte / Ideas de Bomberos | Capital increase | 1,250,000 |
| BioMassBooster | Private investors | Capital increase | 1,200,000 |
| Origo Pharma | Asabys Partners | Participation loan | 1,100,000 |
| VIVEbiotech | Current partners / CDTI Innvierte | Capital increase | 1,020,005 |
| Amadix | Family Office | Capital increase | 1,013,683 |
| Nuage Therapeutics | Asabys Partners | Capital increase | 1,000,000 |
| Biocross | CRB Inverbio / CDTI Innvierte | Capital increase | 950,000 |
| Histocell | Cardiva2 | Capital increase | 887,145 |



| Company | Participating investors | Instrument | Total investment volume pledged (euros) |
|---|---|---|---|
| SOM Biotech | Angloxell Valores y Participaciones | Convertible participation loan | 816,000 |
| Flomics Biotech | Business angels / Family Office | Capital increase | 500,000 |
| Medbiofarma | Current partners | Capital increase | 500,000 |
| Vaxdyn | Bionova Capital / Grupo Arquimea / Mind the Gap Transferencia Tecnológica | Capital increase | 400,000 |
| InnoUp Farma | Inveready / Current partners | Capital increase | 367,000 |
| Prospera Biotech | Private investors | Capital increase | 200,000 |
| Leadartis | Clave Capital | Capital increase | 157,000 |
| Gate2Brain | Mind the Gap Transferencia Tecnológica / BStartip10 | Capital increase | 125,000 |
| Antalgenics | Inveready / CDTI Innvierte | Capital increase and participation loan | 95,000 |
| Limno Pharma | Business angels / Family Office | Capital increase | 74,000 |
| Genomic4All | Private investors | Capital increase | 10,000 |
| Several Companies | Several investors | | 19,500,000 |

**Spanish biotechnology remains on international investors' radar and secures over €100 million.**

The number of capital increases with participation from international investors held steady in 2021 at over €100 million secured. A total of nine companies have received support from investors in countries including Belgium, the United Kingdom, the United States, the Netherlands, Portugal, France, Switzerland, Italy, Germany and Singapore. Worth noting are the operations by Imidomics, exclusively with investors from the US, and those by MOA Foodtech and ADL Biopharma: the former a company that produces food from byproducts and the latter one with a fermentation pilot plant.

Table 2.2. Private capital increase operations with international investors, 2021. Source: AseBio

| | | | |
|---|---|---|---|
| Splicebio | Ysios Capital<br>UCB Ventures<br>Asabys Partners<br>New Enterprise Associates (NEA)<br>Novartis Venture Fund<br><br>Gilde Healthcare | Spain<br>Belgium and United Kingdom Spain<br>United States<br><br>Switzerland and United Kingdom<br>Netherlands | 50,000,000 |
| Imidomics | DNS Capital<br>Bristol Myers Squibb<br>The Pritzker Organization<br>TAO Capital | United States<br>United States<br>United States<br>United States | 14,750,000 |
| ADL BioPharma | Kartesia | United Kingdom | 12,000,000 |
| Peptomyc | Aurora Science<br>Alta Life Sciences<br>HealthEquity<br>Business Angels<br>CDTI Innvierte | Italy<br>Spain<br>Spain<br>Spain<br>Spain | 8,680,000 |
| Medlumics | Asabys Partners<br>VI Partners Swiss Innovation<br>CDTI Innvierte<br>Andera Partners<br>Caixa Capital Risc<br>Innogest Capital<br>Kurma Partners | Spain<br>Switzerland<br><br>Spain<br>France<br>Spain<br>Italy<br>France and Germany | 6,000,000 |
| Integra Therapeutics | Invivo Ventures<br>Advent France Biotechnology<br>Takeda Ventures | Spain<br>France<br><br>United States | 4,500,000 |
| Arthex Biotech | Invivo Ventures<br>AdBio Partners<br>CDTI Inniverte | Spain<br>Spain<br>Spain | 3,500,000 |
| MOA Foodtech | Clave<br>Viscofan<br>Banco Sabadell<br>Big Idea Ventures<br>Eatable Adventures | Spain<br>Spain<br>Spain<br>USA, France and Singapore<br>Spain | 1,400,000 |
| Vaxdyn | Bionova Capital<br>Grupo Arquimea<br>Mind the Gap | Portugal<br>Spain<br>Spain | 400,000 |

# Sanofi, committed to people living with uncommon diseases

Sanofi is an innovative global healthcare company that strives to harness the power of science to improve people's lives. Our team, located in roughly 100 countries, works to transform medical practice to make the impossible possible. We prevent disease through medications and vaccines and provide life-changing treatments for people around the world. This is why we are fully committed to the World Health Organisation's Sustainable Development Goal 3, which aims to ensure healthy lives and promote well-being for all at all ages. And we do so by putting sustainability and social responsibility front and centre in everything we do.

Specifically, Sanofi plays a key role in promoting the wellbeing of people with rare diseases, an area where we are a leader, a benchmark and a pioneer in the fight against minority diseases.



Our role includes research and development (R&D) of treatments and diagnostic tools, as well as raising awareness of people who have these diseases, running educational programmes to support physicians and providing tools to improve the daily lives of these patients and those around them.

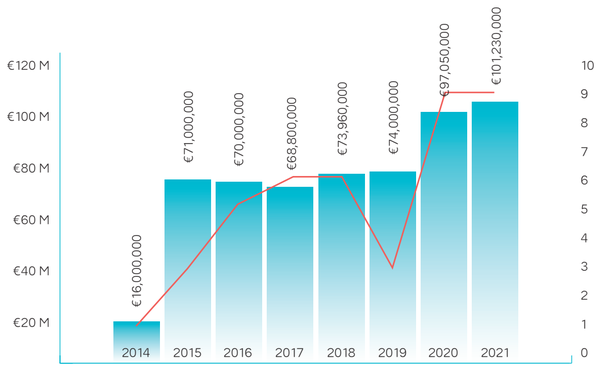
We are currently working on five R&D projects in areas that include rare haematological, neurological and nephrological diseases, which make up 25% of all the company's research projects, making us a global benchmark in this arena. 60 Spanish research centres are currently collaborating on clinical trials under way. Plus, we are supporting nine projects by independent researchers in Spain.

It is important to highlight that these efforts and this commitment require a stable regulatory framework that recognises the specific challenges involved in doing research and development in this arena. The European regulation on orphan medicinal products has been a huge success and helped bring about roughly 180 medications in the EU, benefiting more than 6 million patients.

Here at Sanofi we want to contribute value to society sustainably over time. We do so through campaigns and programmes to raise awareness of the conditions our work focuses on.

Our commitment to minority diseases translates into collaborative programmes carried out with patients associations, healthcare authorities and medical societies:

- Over 20 educational programmes to support patients or healthcare professionals over the past years.
- Developing tools like home therapy for more than 40 patients or mobility grant programmes to help 10 patients improve their quality of life and how they handle the disease.
- Awareness campaigns on rare diseases, such as "Expression of Hope" and "ERes Arte".




Graph 2.2 Evolution of volume of private capital increase operations with international investors (2014-2021).

| | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|---|
| Number of companies | 1 | 3 | 5 | 6 | 6 | 3 | 9 | 9 |
| Total volume | €16 M | €71 M | €70 M | €68 M | €74 M | €74 M | €97 M | €101 M |

## Stock market operations.

In 2021, unlike previous years, there weren't any noteworthy capital increases by issuing stock carried out by companies traded on the continuous market or the BME Growth.

## The Spanish biotech sector is in the spotlight for international corporations.

In 2021, acquisition figures were announced for some biotechnology companies, including Sanifit, which was acquired by Swiss company Vifor Pharma for €205 million up front, €170 tied to milestones and additional payments subject to sales in the hundreds of millions of euros.

Other operations announced include the Kerry Iberia Taste & Nutrition (Ireland) takeover of Biosearch by purchasing shares for €127 million and Grifols sale of VCN Biosciences to US-based Synthetic Biologics for $75 million (€79 million). For its part, Grifols acquired GigaGen for $80 million (€72.7 million) and acquired the rest of Alkahest for €140 million.

In terms of the acquisitions whose prices were not made public, Navarra firm Idifarma was acquired by Ardena, Zendal acquired Laboratorios Ovejero, and Becton Dickinson acquired Cytognos. Plus, Agomab Therapeutics acquired Origo Biopharma and AB Biotek Dr. Healthcare.

## Funding through loans and capital stakes from business development entities is up over 70%.

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 2021, both the volume and number of loan operations and participations in the sector rose. 19 biotech companies secured €5.36 million using this type of instruments, which is up 72% over 2020.

Like in 2020, one of the most noteworthy sources last year was the European Investment Bank, the lending arm of the European Union that grants loans for investments that help achieve the goals of the European Union or other types of institutions. In 2021, biotech firm Anaconda Biomed received €10 million in venture debt from the EIB.

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

Table 2.4 Evolution of loans granted by ENISA and by regional societies in 2021. Source: AseBio, Sodena and ENISA.

**Biotechnology companies continue to turn to crowdfunding.**

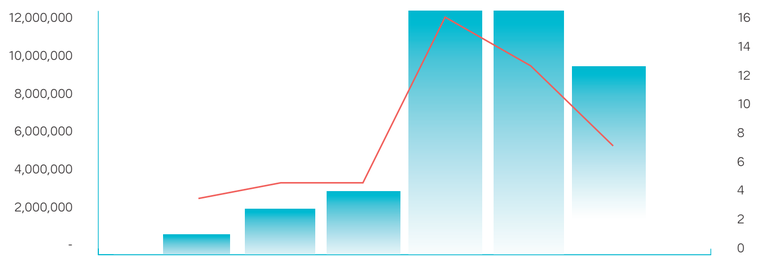
In 2021, both the number of companies using crowdfunding platforms and the volume secured decreased, at €8.4 million.

Despite this decrease, the volume of operations and resources raised were above the levels seen in the years prior to 2019 and 2020, which were exceptional years. The role of Capital Cell stands out, as the main crowdfunding platform in the biotechnology sector: 89% of the volume secured by biotech companies in 2021 was through this platform, compared to 81% in 2020.



| Company | Crowdfunding platform | Total investment volume pledged (euros) |
|---|---|---|
| Amadix | Crowdfunding-Capital Cell | 1,970,112 |
| Aortyx | Crowdfunding-Capital Cell | 1,876,491 |
| 24 Genetics | Crowdfunding-Capital Cell | 1,272,960 |
| Biointaxis | Crowdfunding-Capital Cell | 1,000,000 |
| Neurofix | Crowdfunding-Capital Cell | 952,154 |
| Kintsugi Therapeutics | Crowdfung-Fellow Funders | 897,138 |
| Endolipid Therapeutics | Crowdfunding-Capital Cell | 441,100 |

Table 2.5. Crowdfunding operations by Spanish biotechnology companies in 2021. Source: AseBio and Capital Cell.




| | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|
| Total volume (€) | 1,202,000 | 2,274,700 | 2,900,000 | 10,331,831 | 10,343,922 | 8,409,955 |
| Number of operations | 3 | 4 | 4 | 15 | 12 | 7 |

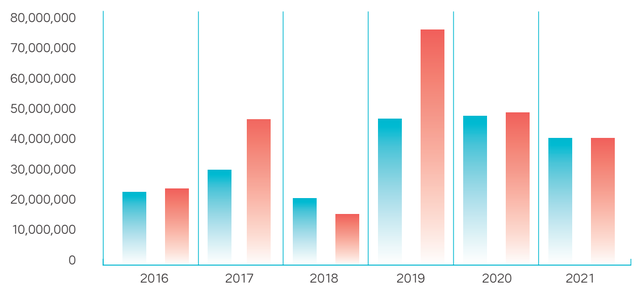
Graph 2.3. Evolution of crowdfunding operations by biotechnology companies. Source: AseBio and Capital Cell.

**The capital pledged and paid out by venture capital operators decreased slightly.**

In summer 2020, Ysios Capital announced its third fund, Ysios BioFund III, with €155 million pledged, but in May 2021 it was closed with a total of €216 million. This makes it the largest Ysios Capital fund to date, aimed at investing in biotechnology companies in the early stages of development working on research into disruptive therapies.

According to the analysis of venture capital managers that invest in Spanish biotechnology companies that AseBio has conducted since 2016, the total pledged and paid out in 2021 dropped slightly. These organisations, CRB, Caixa Capital Risc, Ysios Capital, Inveready, Invivo, Clave, Columbus, Alta Life Sciences and Asabys, pledged and paid out a similar amount, €40.7 million, which is a 15% drop in the amount paid out and a 16% drop in the amount pledged.

Graph 2.4. Evolution of volume paid out and pledged. 2016 – 2021. Source: AseBio.




| 2016 | | 2017 | | 2018 | | 2019 | | 2020 | | 2021 | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Paid out (€) | Pledged (€) | Paid out (€) | Pledged (€) | Paid out (€) | Pledged (€) | Paid out (€) | Pledged (€) | Paid out (€) | Pledged (€) | Paid out (€) | Pledged (€) |
| 23,560,230 | 24,189,375 | 30,390,940 | 46,281,176 | 21,208,538 | 16,814,722 | 46,798,458 | 74,261,105 | 47,744,184 | 48,451,624 | 40,769,104 | 40,720,476 |



# 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 we analyse the evolution of CDTI grants for R&D projects in the biotechnology arena since 2015, and those awarded by the AEI State Programme for Research, Development and Innovation and the State Programme for the Promotion of Scientific and Technical Research of Excellence 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 2021, 82 projects in biotechnology were funded, including projects for individual and cooperative R&D, CIEN projects (National Business Research Consortia), EMFF innovation projects (European Maritime and Fisheries Fund), Science and Innovation Missions Programme, 10 projects in biotechnology under the Neotec Grants, 18 R&D projects related to the Covid-19 healthcare emergency, including individual and cooperative R&D projects and some through the Science and Innovation Missions Programme.

| | Number of projects | Total budget (€) | Total awarded (€) | Non-repayable portion / grant (€) | Repayable portion (€) |
|---|---|---|---|---|---|
| R&D projects approved in the biotechnology arena | 82 | 47,348,274 | 38,057,782 | 13,570,135 | 24,487,647 |
| R&D projects approved related to the Covid-19 healthcare emergency | 18 | 12,054,198 | 9,113,026 | 6,593,548 | 2,519,478 |
| Neotec grants | 10 | 4,029,990 | 2,998,067 | 2,998,067 | 0 |
| Total | 110 | 63,432,462 | 50,168,875 | 23,161,749 | 27,007,125 |

Tabla 2.6. R&D projects approved in the biotechnology arena, 2021. Source: CDTI.

## Evolution of projects funded by the CDTI in the biotechnology arena.

The amount the CDTI granted to projects in the biotechnology arena was 3% higher than in 2020. However, regarding the total budget, the decrease (roughly 1%) compared to the increase in projects approved (24%) is explained by their smaller size (more projects approved but with smaller budgets).

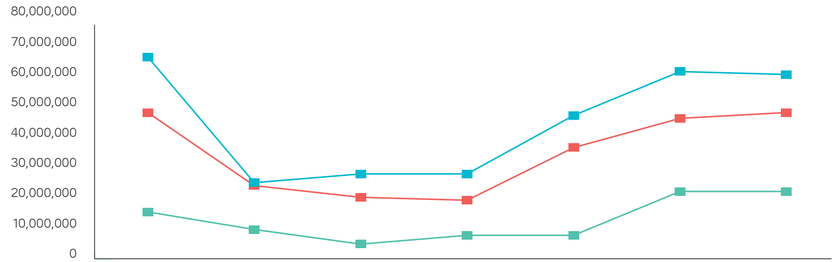
In terms of the non-repayable portion, it is important to take into consideration that the extraordinary grant call to tackle the Covid-19 healthcare emergency in 2020 awarded subsidies, while the grants for projects in the biotechnology arena for Covid-19 in 2021 were in part loans (partially repayable grants) and in part subsidies through the Science and Innovation Missions Programme, without any extraordinary calls.



This is why the repayable portion, tied to the loans, was slightly higher in 2021 than in 2020 (8%); while the non-repayable portion (subsidised) was lower, roughly 2%. This same reason explains the three percent drop (from 49% to 46%) in the % NRP vs. total Awarded, as there is a "normalisation" in grants awarded (84 loan operations vs. 26 subsidy operations in 2021).

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|
| Total budget (€) | 69,379,626 | 26,997,606 | 29,153,878 | 29,263,359 | 49,209,769 | 64,083,042 | 63,432,462 |
| Total awarded (€) | 50,701,328 | 25,751,881 | 21,382,075 | 20,069,625 | 38,635,449 | 48,635,853 | 50,168,875 |
| Non-repayable portion (€) | 16,543,458 | 10,848,637 | 5,719,520 | 8,797,848 | 8,976,247 | 23,656,245 | 23,161,750 |
| Repayable portion (€) | 34,157,869 | 14,903,244 | 15,662,555 | 11,271,777 | 26,315,918 | 24,979,608 | 27,007,125 |
| Number of projects | 46 | 29 | 42 | 57 | 75 | 89 | 110 |
| % TNR vs. Awarded | 33% | 42% | 27% | 44% | 23% | 49% | 46% |

Table 2.7. Evolution of R&D projects approved in the biotechnology arena. Source: CDTI.




Graph 2.5. Evolution of R&D projects approved by CDTI in the biotechnology arena (2015-2021). Source: CDTI.

| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|
| Total budget (€) | 69,379,626 | 26,997,606 | 29,153,878 | 29,263,359 | 49,209,769 | 64,083,042 | 63,432,462 |
| Total awarded (€) | 50,701,328 | 25,751,881 | 21,382,075 | 20,069,625 | 38,635,449 | 48,635,853 | 50,168,875 |
| Non-repayable portion (€) | 16,543,458 | 10,848,637 | 5,719,520 | 8,797,848 | 8,976,247 | 23,656,245 | 23,161,750 |

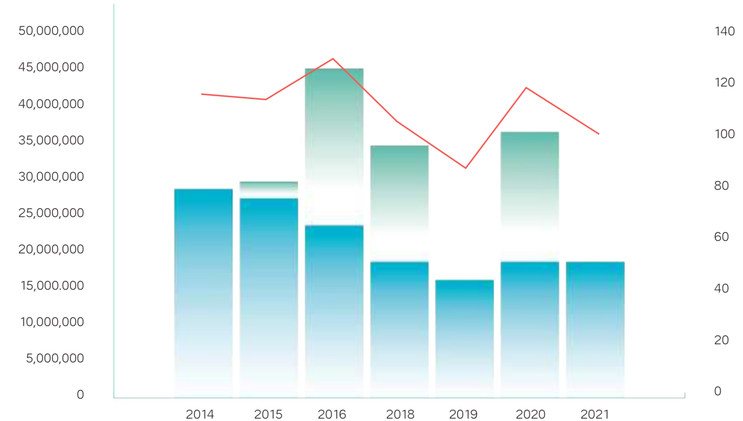
## Evolution of projects funded by the Spanish State Research Agency in the biotechnology arena.

Graph 2.6 shows the evolution of the number of grants and the total amount granted by the AEI in the biotechnology sector between 2014 and 2021.

These grants fall under the State Programme for Knowledge Generation and Scientific and Technological Strengthening of the R&D&i System, the State R&D Programme Oriented to the Challenges of the Society and Challenges-Collaboration R&D Projects in years when there was a call.

If we compare the corresponding grants without the Challenges-Collaboration Project, as there isn't a call every year, in 2021 the amount awarded to the biotechnology sector dropped slightly, down 3%. The number of grants awarded also dropped 9%, from 93 to 85.






Graph 2.6. Evolution of R&D projects approved in the biotechnology arena (2014-2021). Source: Compiled internally from AEI data.

| | 2014 | 2015 | 2016 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|---|---|
| Number of grants | 116 | 114 | 126 | 96 | 73 | 109 | 85 |
| Amount granted (€) | 23,486,620 | 22,271,260 | 19,266,830 | 15,831,035 | 13,428,459 | 15,590,475 | 15,106,850 |
| Amount Challenges-Collaboration (€) | | 1,427,800 | 23,850,904 | 12,812,862 | | 16,581,297 | |

# Reimagining medicine to improve and prolong people's lives

Novartis is a pharmaceutical company driven by its technological leadership in research and development, commercial excellence, access to treatments and data science. Novartis is reimagining medicine to improve and prolong people's lives. Our innovative therapies and treatments, which have helped improve the lives of over 750 million people around the world and 10 million in Spain in 2021 alone, encompass the majority of pathologies, from cardiovascular disease and cancer to rare genetic conditions. This is our purpose. We've evolved as an organisation for centuries, since 1750, always working to stay on the cutting-edge of knowledge to have a positive impact on people's health.

Discovering and developing innovative treatments, as well as finding new formulas to make them accessible to as many people as quickly as possible, are what drive the more than 104,000 people that make up our team around the world and the nearly 2,200 that are Novartis in Spain. Multidisciplinary professionals who do their jobs based on excellence and putting patients' needs centre stage in their day-to-day work.

Thanks to the driving force of scientific innovation and digital technology, we work to create new treatments that address unmet needs that still exist in the health arena. But the world is changing quickly, posing new challenges we must adapt constantly.

Improving access to medicines and healthcare is a complex challenge that can't be resolved by any one organisation on its own. So, our goal is to help transform the healthcare system in collaboration and joint responsibility with public and private partners, with different capacities, to provide sustainable solutions and build a system that prioritises getting the best possible results for people.



NOVARTIS

SUSTAINABLE DEVELOPMENT GOALS

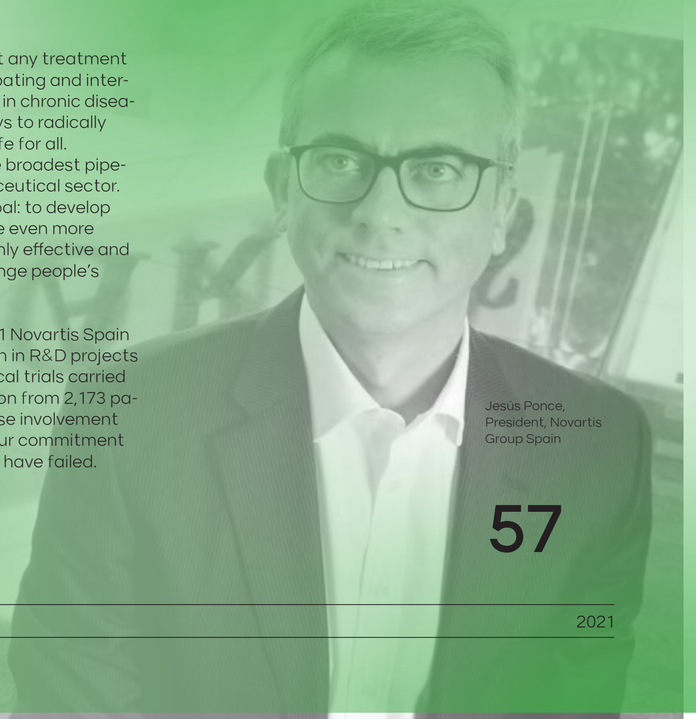
3 GOOD HEALTH AND WELL-BEING

Our commitment in this arena includes offering innovative treatments to broaden the therapeutic options available to patients and healthcare professionals; finding new formulas to expand patients' access to our treatments and setting their monetary value responsibly, based on their clinical, social and economic contribution to society; and driving sustainability in the Spanish healthcare system with a focus based on generating and measuring value.

We are aware that innovation is a key lever of transformation that must be used to serve patient wellbeing. So, we firmly believe in the need to strengthen commitment to innovation by defying established medical paradigms even more forcefully; exploring new options to find advanced, gene and cell therapies that have the potential to cure pathologies without any treatment alternatives; anticipating and intervening much earlier in chronic diseases; and finding ways to radically improve quality of life for all.

We have one of the broadest pipelines in the pharmaceutical sector. All with one clear goal: to develop treatments that are even more transformative, highly effective and first-in-class to change people's lives.

And to do so, in 2021 Novartis Spain invested €100 million in R&D projects that led to 225 clinical trials carried out with participation from 2,173 patients, without whose involvement and collaboration our commitment to innovation would have failed.



Jesús Ponce, President, Novartis Group Spain

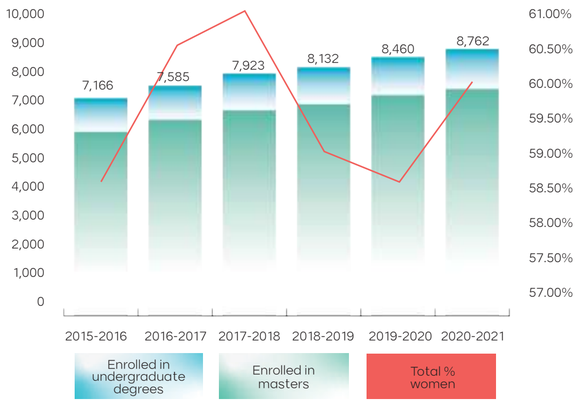
# TALENT AND DIVERSITY

# 03

## Over 60% of students enrolled in biotechnology studies are women.

Students' interest in biotechnology continues to grow (graph 3.1). Since the 2015-2016 academic year, the number of students enrolled in undergraduate or masters studies in biotechnology has increased roughly 4% each year. In 2020-2021, the latest academic year for which data is available, there were more than 8,700 students in total, including undergraduate and masters studies.

Of these 8,700 students, the number of women enrolled in these programmes rose 3% to over 60%.




Graph 3.1. Evolution of number of students enrolled in university studies in biotechnology (undergraduate and master) 2015-2021. Source: Compiled internally from Statistics on University Students of the Ministry of Science, Innovation and Universities.

## Biotechnology is among the degrees that require the highest marks on university entrance exams.

The admissions scores checked on 30 May 2022 show that biotechnology degrees remain among the highest required in 2022, among the top 10 admissions scores required at 19 of the 24 public universities that offer biotechnology programmes.

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

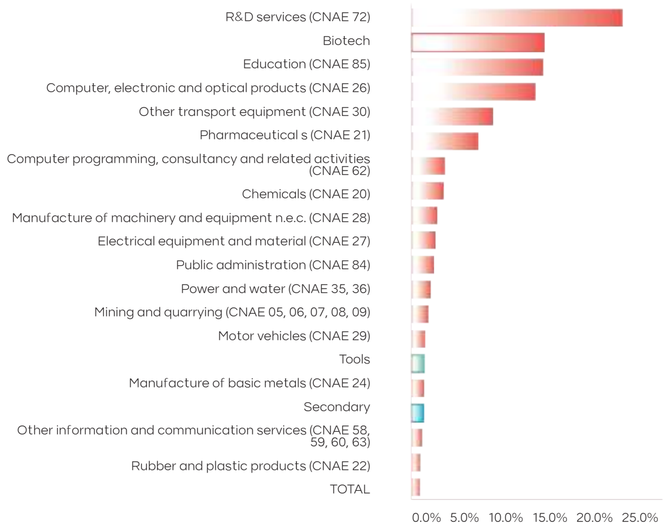


This is similar for directly related degree programmes, such as biomedical engineering, which is also among the top 10 admissions scores at 17 of the 20 public universities that offer this degree, which has been offered for the first time in 2021-2022 at 4 new universities.

Additionally, there has been a visible increase in new universities degrees related to biotechnology or in combination with other degrees with increasing demand, such as nanotechnology, mechanical engineering, telecommunications, innovation and processes, food technology, among others. In this year's query, over 10 public universities now offer these degrees.

## Biotech firms employ the most researchers.

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 13.23% of all employees. Furthermore, companies with biotechnology as a secondary activity and those that use it as a production tool have quite a bit more moderate ratios, although above the average for the economy in general in both cases, which is roughly 0.9% of total employment.




Graph 3.2. Ratio of researchers to total employment in 2020 (percentage of researchers to total employees). Source: Compiled Compiled internally from the 2020 INE Survey on Biotechnology Use and INE Statistics on R&D activities.

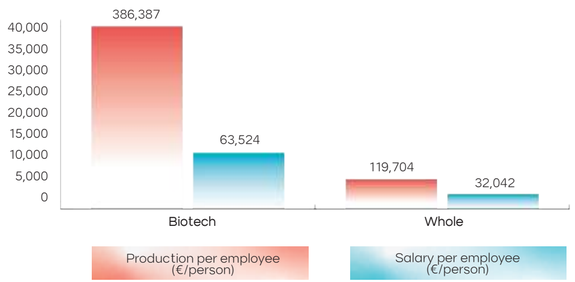
Graph 3.3. Evolution of the percentage of researchers to total R&D personnel. Source: Compiled internally from the INE Survey on Biotechnology Use.

The percentage of researchers to total R&D personnel at biotechnology companies is 55% and for biotech firms is 57%. In both cases, the percentage remained the same as the previous year, 2019 (graph 3.3).


Graph 3.4. Basic productivity and salary ratios for employees at biotech firms. Source: Compiled internally from a sample of companies collected by AseBio.

**The salary per employee at biotech firms is nearly double the national average.**

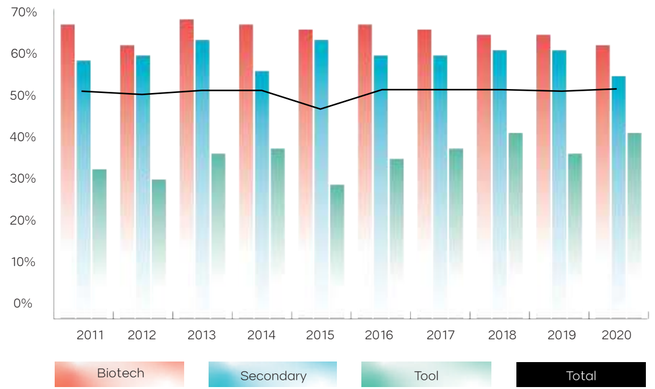
Average productivity at biotech firms is over €386,000 per employee compared to €120,000 on average for the Spanish economy as a whole, which is also reflected in average salaries that are nearly double the national average (graph 3.4).






**Biotech firms lead the ranking in presence of female researchers on staff.**

The presence of women in the biotechnology sector has held steady, although with some changes. As graph 3.6 shows, for biotech companies the percentage of women has gone from 55% to 53%. This is the same for companies with biotechnology as a secondary activity, where they went from 52% to 47%. However, companies that use biotechnology as a production tool saw an increase in women on staff, from 32% to 36%.




Graph 3.5. Evolution of women in biotechnology activities as a percentage of all employees. Source: Compiled internally from on Biotechnology Use.

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 59%, behind pharmaceutical activities and healthcare and social services. Plus, this percentage is well above the average for the economy as a whole, where women's participation in R&D activities is just 31% (graph 3.6).

If we look at the total ranking, women remain under-represented in R&D activities in 39 of the 45 activities analysed and make up 31% on average.

# IQS contribution to the new agenda for sustainable growth

After two difficult years when organisations involved in developing biotechnology in Spain have worked together to find solutions to the healthcare crisis caused by Covid-19, now as I'm writing these lines, we find ourselves facing a new crisis: the war in Ukraine. Nevertheless, it is in these complex times when our institutions have the opportunity to demonstrate the values that define us and how we apply them.

We take aligning our activity with the goals on the agenda for sustainable growth very seriously and have seen how this is in line with the values that define our mission and the Universal Apostolic Preferences (UAP) of the Society of Jesus.

We would like to describe some of our activities in line with those goals. Starting with the goal of peace and justice, the IQS Ethics Chair is coordinating several actions to help alleviate some of the many effects of the humanitarian crisis of the war in Ukraine. These include collecting and sending basic necessities and helping refugees with accommodations, guidance and integration.

Improving health and wellbeing are also part of our core values and we contribute to them through biomedical research. At IQS we are committed to encouraging scientific vocations among our students and conduct applied research to develop better, more effective therapies.

Furthermore, we believe it is essential to transfer all this knowledge to companies and, by extension, society, contributing to the economic transformation of our country. With the aim of boosting the sustainable development of industries, innovation and infrastructures, we work through the IQS Tech Transfer unit to connect our research with companies on a daily basis.

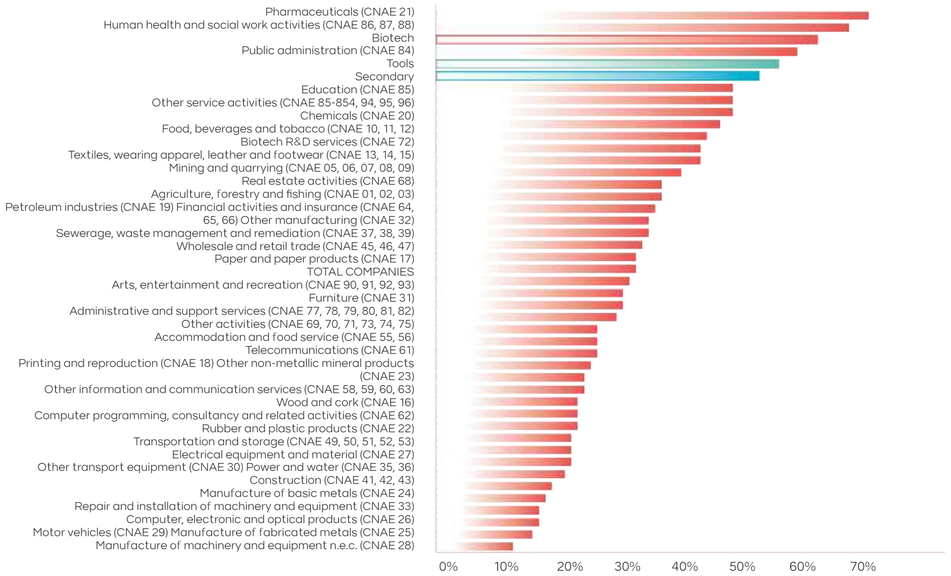
We firmly believe that promoting a more knowledge-intensive society will allow us to enjoy a better future.

Finally, another of the most important goals of sustainable growth, in our view, is quality education. At our hundred-year-old institution, we work very hard and are very motivated to promote quality education through a model based on excellence that, with the learning-by-doing approach, aims to train students to become excellent professionals and, most importantly, valuable members of society.

We've seen that the pandemic has driven up demand for university enrolment in the life sciences, which we believe is very positive as it recognises the contributions science has made to resolving the Covid-19 crisis. In response to this demand, IQS is launching a new degree in Biomedicine for the 22-23 academic year, expanding the courses on offer at our centre.

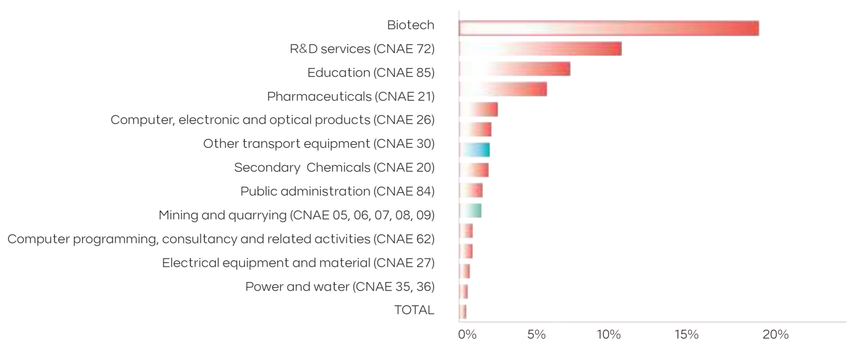
In conclusion, through the mission and vision of IQS, we hope to contribute to sustainable growth that takes all members of our society into account and ensures a just future for all.

Graph 3.6. Percentage of women to total R&D personnel. Source: Compiled internally from the 2020 INE Survey on Biotechnology Use and INE Statistics on R&D activities.




Biotech firms lead in the presence of female investigators, technicians and assistants, as a percentage of the total employment in all areas of activity. They make up 15% of total employment, for female researchers, and 7% for technicians and assistants. These figures are far higher than the national averages of 0.38% and 0.21% respectively and above sectors like pharmaceuticals and chemicals (graph 3.7).






Graph 3.7. Ratio of female researchers to total employees in 2020 (percentage of female researchers to total employees). Source: Compiled internally from the 2020 INE Survey on Biotechnology Use and INE Statistics on R&D activities.

**Women make up 30.2% of executive teams at biotechnology firms.**

The gender bias is particularly noteworthy at the executive level, so while women make up 46% of the total work force they only hold 33% of executive positions.

At biotech firms, female representation among executive teams is quite a bit higher, with women holding 15.8% of CEO positions and 21.1% of executive positions.

These percentages are significantly higher than those the INE records for IBEX-35 companies (6% and 3% respectively). Similarly, among the executive teams identified at biotech companies, women make up over 30%, nearly 10% higher than executive positions at IBEX companies.

Table 3.1. Female presence in management teams at biotech companies in 2020. Source: Compiled internally from the Companies House registry and companies' websites. (*) Data from the INE and Institute of Women. Ministry of Equality.

| | % Women | |
|---|---|---|
| | Biotech | IBEX-35(*) |
| President | 15.8% | 6.0% |
| Executive management | 21.1% | 3.0% |
| Executive teams | 30.2% | 23.2% |

# Innovative diagnostic solutions to improve women's health

MiMARK is a spin-off of the Vall d'Hebron that focuses on women's health and is led by women. Our mission is to improve gynaecological diagnostics through innovative, non-invasive solutions based on gynaecological fluid. Our vision is to make gynaecological fluid the new liquid biopsy to improve handling of patients with gynaecological disorders, improving quality of life and facilitating clinical decision-making.

Our first product is WomEC, a diagnostic test for endometrial cancer (EC). EC is the most common gynaecological cancer and incidence is expected to hit 46% by 2040. While it's true that 90% of EC patients have abnormal vaginal bleeding, the symptom that marks the beginning of the diagnosis process, that diagnosis fails in 30% of cases. Today, EC diagnosis is based on observing malignant cells in uterine fluid from an endometrial biopsy (pipelle biopsy).

A diagnosis can't be reached in 30% of cases given the lack of cells, so additional, invasive diagnostic tests are required, which put the patient at risk. We've estimated that 11 million women have abnormal vaginal bleeding in Europe and the US each year and have to begin the EC diagnosis process. Only 10% of these women will eventually be diagnosed with the disease.

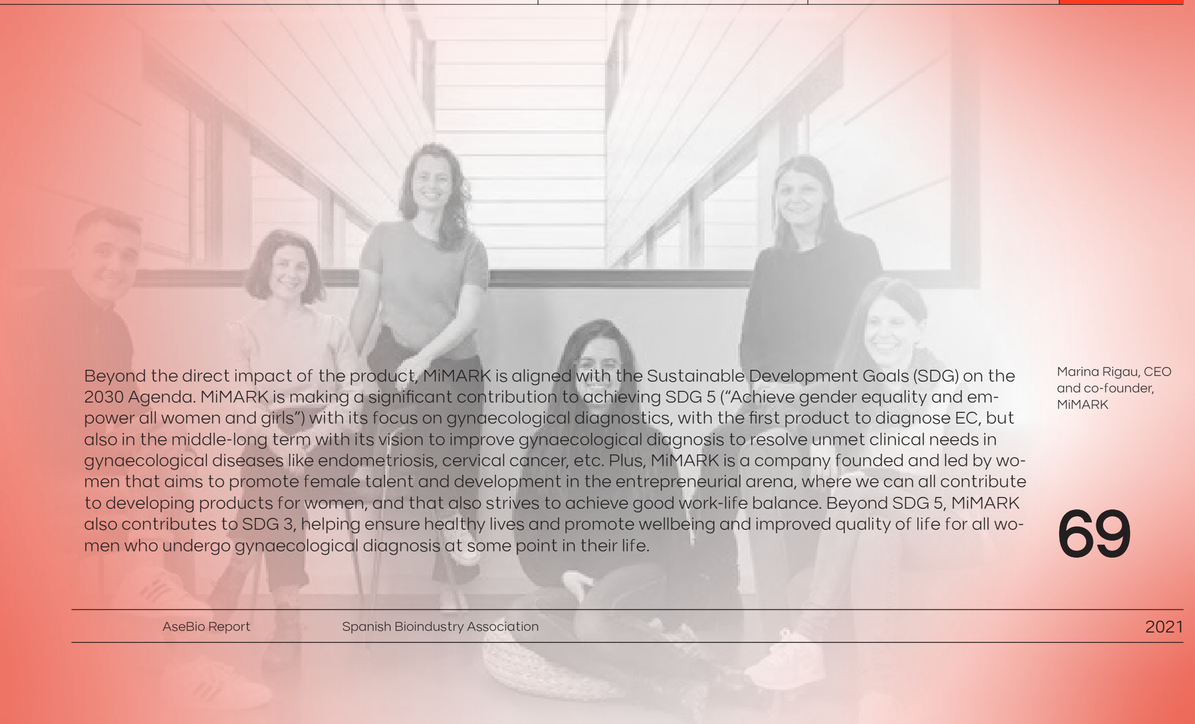
WomEC is an immunoassay that uses uterine fluid obtained from a pipelle biopsy. Our patented solution offers a faster, more objective and precise diagnosis of EC, compared to current clinical practice, for all patients on the first visit, avoiding the need for invasive procedures and improving quality of life. Plus, for the healthcare system, WomEC provides an objective test that allows physicians to easily discard healthy patients, without putting them through invasive procedures, which also comes with significant savings.



MIMARK

SUSTAINABLE DEVELOPMENT GOALS

5 GENDER EQUALITY



Beyond the direct impact of the product, MiMARK is aligned with the Sustainable Development Goals (SDG) on the 2030 Agenda. MiMARK is making a significant contribution to achieving SDG 5 ("Achieve gender equality and empower all women and girls") with its focus on gynaecological diagnostics, with the first product to diagnose EC, but also in the middle-long term with its vision to improve gynaecological diagnosis to resolve unmet clinical needs in gynaecological diseases like endometriosis, cervical cancer, etc. Plus, MiMARK is a company founded and led by women that aims to promote female talent and development in the entrepreneurial arena, where we can all contribute to developing products for women, and that also strives to achieve good work-life balance. Beyond SDG 5, MiMARK also contributes to SDG 3, helping ensure healthy lives and promote wellbeing and improved quality of life for all women who undergo gynaecological diagnosis at some point in their life.

Marina Rigau, CEO and co-founder, MiMARK

# BUSINESS FABRIC

04

**Nearly 4,000 companies carried out biotechnology activities in 2020, of which 862 are exclusively biotech firms.**

2019 was marked by a strong expansion of the sector, with the number of companies increasing 20%. The figures for 2020 show that trend continued, although at a more moderate pace of 9% growth.

This meant an increase in the ratio of biotechnology companies to the total, with a record of more than 2.6 biotechnology companies per 1,000 businesses.

Biotech firms also grew 9% in 2020, with 862 companies. Companies with biotechnology as a secondary activity dropped 1.6% and companies that use biotechnology as a production tool rose 10.3%.

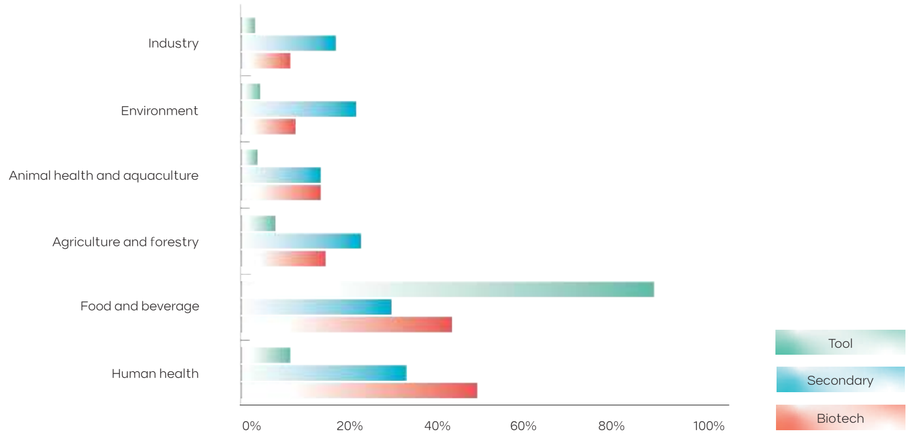

Graph 4.1. Evolution of the number of biotechnology companies. Source: Compiled internally from the INE Survey on Biotechnology Use and AseBio lists.



**Human health and food make up 90% of all fields of application in biotech firms.**

As we see in graph 4.2, by field of application, biotech firms are concentrated in human health and food, which make up nearly 90% of the total.

This distribution pattern by fields of application is similar among companies with a secondary focus, although less concentrated. However, 48% of these companies work in agriculture and forestry, and the environment. Finally, among companies that use biotechnology as a production tool, food is clearly a dominant focus, with over 82% of the total.




Graph 4.2. Breakdown of biotechnology companies by field of application. Source: INE. Survey on Biotechnology Use. 2020.

## 53% of biotech firms are micro-SMEs and 43%, SMEs.

Nearly 53% of the 862 companies analysed are micro-SMEs with fewer than 10 employees. These firms have an average turnover of less than €500,000 and make up 1.8% of total turnover for all biotech firms (table 4.1). Of these, 43.35% are small and medium-sized companies, which contribute 50.1% of joint turnover.

At the other extreme, we find 25 large corporations with over 250 employees, whose average turnover is more than €230 million and make up 48% of joint turnover.

Table 4.1. Breakdown of biotech firms by size. Source: Compiled internally from a sample of companies collected by AseBio.

| | Number of Companies | % of Total | Average turnover € millions | % of Total turnover |
|---|---|---|---|---|
| Micro-SME (fewer than 10 employees) | 548 | 52.9% | 0.4 | 1.8% |
| Small (10 to 49) | 197 | 29.5% | 5.8 | 9.5% |
| Medium (50 to 249) | 92 | 13.8% | 53 | 40.5% |
| Large (more than 250) | 25 | 3.7% | 233 | 48.1% |
| TOTAL | 862 | 100% | 14.0 | 100% |

## Catalonia, leader in biotech companies and average turnover.

Catalonia again leads in number of biotech companies in Spain, with over 24% of the total and more than 45% of total turnover. Companies in Catalonia also have higher average turnover, surpassed only by those in Madrid. It also has a higher average turnover, its contribution to the Gross Added Value (GVA) in the region or the regional GDP is more than 0.91% compared to 0.34% on average for all of Spain (table 4.2).

Behind Catalonia in number of companies are Madrid, with 151, and Andalusia, with 123; and in average turnover, Aragon with 0.66% and Madrid with 0.42%.



Table 4.2. Territorial breakdown of biotech firms. Source: Compiled internally from a sample of companies collected by AseBio.

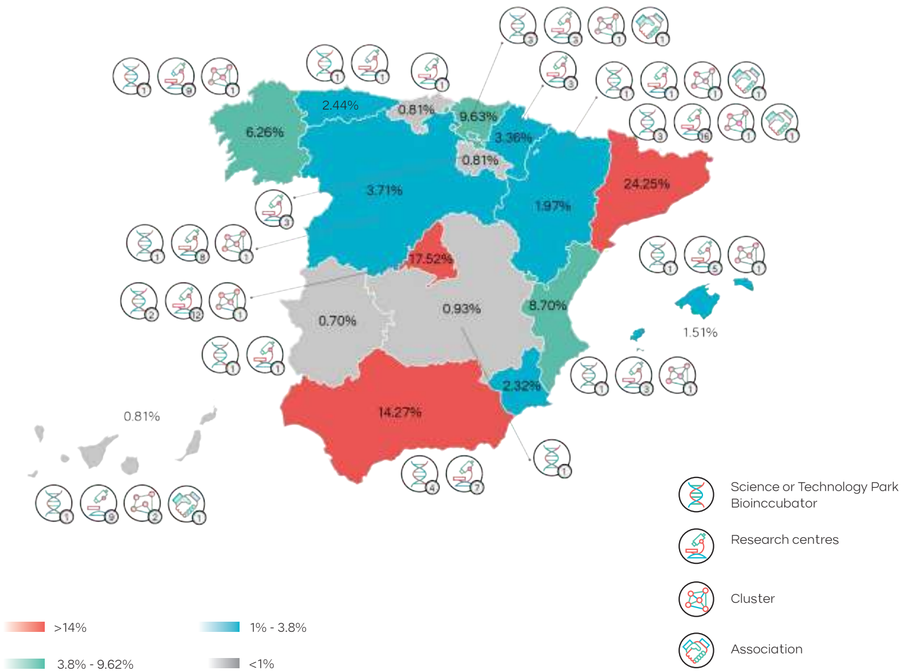
| | Number of Companies | % of Total | Average turnover € millions | % of Total turnover | GVA in % of Regional total |
|---|---|---|---|---|---|
| Andalusia | 123 | 14.27% | 4.5 | 4.59% | 0.12% |
| Aragon | 17 | 1.97% | 25.1 | 3.53% | 0.66% |
| Asturias | 21 | 2.44% | 2.3 | 0.39% | 0.11% |
| Balearic Islands | 13 | 1.51% | 0.3 | 0.03% | 0.01% |
| Canary Islands | 7 | 0.81% | 0.6 | 0.04% | 0.01% |
| Cantabria | 7 | 0.81% | 17.6 | 1.02% | 0.38% |
| Castile and León | 32 | 3.71% | 5.9 | 1.56% | 0.16% |
| Castile-La Mancha | 8 | 0.93% | 5.3 | 0.35% | 0.03% |
| Catalonia | 209 | 24.25% | 26.6 | 45.98% | 0.91% |
| Valencian Community | 75 | 8.70% | 3.9 | 2.43% | 0.09% |
| Extremadura | 6 | 0.70% | 7.0 | 0.35% | 0.02% |
| Galicia | 54 | 6.26% | 6.4 | 2.87% | 0.20% |
| Madrid | 151 | 17.52% | 27.6 | 34.52% | 0.42% |
| Murcia | 20 | 2.32% | 1.1 | 0.18% | 0.04% |
| Navarra | 29 | 3.36% | 3.4 | 0.82% | 0.29% |
| Basque Country | 83 | 9.63% | 1.9 | 1.32% | 0.12% |
| La Rioja | 7 | 0.81% | 0.4 | 0.02% | 0.01% |
| TOTAL | 862 | 100% | 14.0 | 100% | 0.34% |

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.

Catalonia still has the largest number of companies, followed by the Community of Madrid and Andalusia. The next tier includes the Basque Country, Valencian Community and Galicia.

In terms of the biotechnology ecosystem, Catalonia is at the top, followed by the Community of Madrid, Andalusia, Canary Islands, Galicia and Castile and Leon, which are in the same tier in terms of number of facilities (research centres and science parks).






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

# What can we do to preserve the 1% of the water that gives us life?

Water is a nuanced issue when speaking about sustainability. With the air we breathe, it is the other essential ingredient of life as we know it.

Even though the surface of our planet is 70% water, only 2.5% is fresh water and just 1% is easily accessible. So it is essential to protect that 1% from the pressures it is experiencing in terms of quality.

An excess of nutrients like phosphorous or nitrogen, pesticides and herbicides, hydrocarbons, plastic waste and a long etcetera have a negative effect on our water supply.

Biotechnology can be and is a great ally with its research and development of solutions to boost the sustainability of this essential resource.

At Biorizon Biotech, as stakeholders in the industry, we have been devoting our resources to researching, analysing and launching products that provide solutions to this issue for years.

We have focused our efforts on four specific lines. The first of them is water generation by taking advantage of nutrients and bioremediation processes. More than 80% of wastewater from human activity goes into rivers or seas without being treated, which causes pollution and roughly 70% of all water from rivers, lakes and aquifers is used for watering.

We use microalgae, including cyanobacteria, to regenerate water and runoff by removing mineral compounds and breaking down organic materials, which yields microalgae biomass and regenerated water for use in agriculture or watering gardens.

The second line tackles the issue from the standpoint of reducing the use of essential chemicals in agriculture with products that reduce the need to add nitrogen and mineral phosphorus, as well as other fossil-based fertilisers. Using biological solutions, we provide biological-based nutrients with direct nutritional action, as well as incrementing and fostering microbiota activity, encouraging interaction and promoting plant growth.

The third line is marketing products based on microorganisms, such as microalgae, cyanobacteria and bacteria, developed from natural extracts, all of which replace conventional chemical treatments, without any harmful effects on water.

Finally, we tackle all our processes from an approach based on the circular economy, and encourage and train our clients in the agricultural sector to choose sustainable farming systems with our various solutions and products, where we are the first link in the chain, using processes that contribute to this goal by growing our own raw materials.

For example, our Microalgae Cultivation Plant, Agora-Sabana, which is not only the largest in Europe for agriculture but also has the $CO_2$ absorption of a large forest, with each kilogram of biomass absorbing two kilograms of $CO_2$.

It is time to focus all our efforts on preserving the quality of that 1% of water on our planet and we are proud to be an active part of the solution along with the rest of the companies that make up AseBio.

David Iglesias, CEO, Biorizon Biotech

## 43 new biotech companies were created in 2021.

AseBio's yearly study of the number of companies working in biotechnology created each year identified 43 new biotech companies, 13 fewer than in 2020.

Of these companies, 14 were set up in Catalonia, 9 each in the Basque Country and Galicia, and Murcia stands out with 5 new companies. Table 4.3 shows their activity, company name and the Autonomous Community where they are located.

| Company name | Autonomous community | Activity |
|---|---|---|
| Acpharma Iberia Medical | Murcia | Development, formulation, manufacture and sale of food products (nutraceutics) to improve consumers' lifestyle and health. |
| Alba Biotech | Basque Country | Manufacture and commercialisation of self-diagnostic tests to detect chemical submission drugs. |
| Amaltea Research | Basque Country | Dairy analysis system based on lipid profile from mass spectrometry and artificial intelligence. |
| Aromas de Narcea | Asturias | Research, production, transformation and commercialisation of products derived from Rosa Narcea and other plant species. |
| Asuque | Galicia | Making beverages by fermenting the sugars in whey after making cheese. |
| Betascreen | Catalonia | Exploitation of machine learning algorithms that predict abnormalities in Alzheimer biomarkers based on brain MRIs. |
| Bioence | Basque Country | Bioreactors for in vitro studies that provide a more realistic cell environment based on the human body. |
| Blueming | Murcia | Design and implementation of technology for better management of water resources. Development of tools to analyse water and its dissolved chemical compounds resulting from biological and industrial activities, and manage them. |
| Bonelav Biomedical | Galicia | Experimental research and development in biotechnology, carrying out all sorts of activities and services related to the manufacture and sale of medical and dental devices and instruments for dental implants. |
| Celtarys Research | Galicia | Design and synthesis of fluorescent probes to be used in drug discovery. Proprietary technology to develop fluorescent ligands with optimal pharmacological and photophysical properties. |
| Devshealth | Catalonia | Discovery of new anti-infectious treatments using proprietary technology platform. |
| Disit Biotech | Madrid | Development of pharmaceutical products with a large impact on patients' lives. |
| Endolipid Therapeutics | Catalonia | Development of a new approach to reduce ectopic fat with therapeutic applications to treat cellulite and NASH using peptides that imitate SHBG function. |
| Gc Genomics España | Extremadura | Plant and animal genomic selection. |
| Hesi Biopharma | Galicia | Development of innovative, top-quality natural ingredients for animal and plant nutrition using insects (mealworms). |

| Company name | Autonomous community | Activity |
|---|---|---|
| Ikosaedrika Biologicals | Basque Country | Development of vaccines based on VLPs (virus-like particles) from Triatoma virus. Vaccine prototypes for Acute myeloid leukaemia, melanoma, Chagas disease and listeriosis. |
| Ilender Ciencia y Tecnología | Andalusia | Discovery and development of probiotics that produce bioactive compounds, from microorganisms isolated from exotic sources, that provide solutions to health problems in the veterinary sector. |
| Innervia Bioelectronics | Catalonia | Construction of neuro-electronic interfaces to cure brain disorders. |
| Innomy Biotech | Basque Country | Development and production of meat alternatives using fungal tissue. Technology based on cultivating the tissue in a plant-based medium using solid-state fermentation. |
| Kintsugi Therapeutics | Catalonia | Development of innovative therapies to regulate endoplasmic reticulum stress to treat liver conditions or other pathologies. |
| Laboratorios Poutás | Galicia | R&D to prevent and fight pests; analysis, elimination and reuse of micro- and nano-plastics from water and soil; revalorisation of byproducts and waste from the sector to promote the circular economy. |
| Longseq Applications | Murcia | Mass long-read DNA sequencing (third-generation sequencing) using nanopore technology. |
| Medcann Europe | Basque Country | Manufacturing, conditioning, distributing and commercialising pharmaceutical specialities based on the cannabis plant and its derivatives for therapeutic use. |



| Company name | Autonomous community | Activity |
|---|---|---|
| Mimark Diagnostics | Catalonia | Development of innovative in vitro assays to resolve unmet clinical needs. Including WomEC to diagnose endometrial cancer. |
| Mitodegen | Galicia | R&D and drug discovery in the field of neurodegenerative diseases. |
| Nanokide Therapeutics | Basque Country | Development of a nanoparticle combined with miRNA that has been used as a therapy for liver metastasis caused by colon cancer in an animal experimentation model. |
| Nanotecnos | Galicia | Development of clean technology to eliminate pollutants (hydrocarbons, heavy metals, cyanotoxins, mycotoxins, etc.) from aqueous environments. Technology consists of a platform of magnetic nanoparticles with lignocellulosic materials and consortia of microorganisms (bacteria and fungi). |
| Nuage Therapeutics | Catalonia | Development and discovery of new drugs for therapeutic targets that, given their structural properties, are currently considered “undruggable”. |
| Ods Protein | Galicia | Production of alternative proteins through fermentation, with the perfect formulation and texture to be used as an ingredient in various food products. |
| Omniscope España | Catalonia | Redesign of diagnostic medicine to detect diseases earlier, more broadly and with unprecedented sensitivity and accessibility. Uniting many disciplines, including genomics, AI and public health. |

| Company name | Autonomous community | Activity |
|---|---|---|
| Perseo Biotech | Valencia | Development of processes to turn organic waste into new products with value added: biofuels, bioenergy and bioproducts. |
| Proteinmat Materials | Basque Country | Innovative bioinks for medical applications. |
| Real Deal Milk | Catalonia | Precision fermentation to produce casein and whey. |
| Sicells Veterinary Biotechnology | Murcia | R&D and commercialisation of advanced therapy drugs, made from stem cells and derivatives for veterinary patients (dogs, cats and horses) with inflammatory and/or immune diseases that can benefit from the anti-inflammatory and immunomodulatory properties of these biological therapies. |
| Solitek | Catalonia | Discovery, early-stage development and manufacture of active small-molecule ingredients. |
| Startquake | Asturias | Development and manufacture of biotechnology, artificial intelligence and discovery of biomarkers for applications in health and sports performance. |
| Syngoi Technologies | Basque Country | Production of synthetic DNA using a new enzymatic process that can cover the needs of advanced therapies in which DNA is an essential material. |
| Tailor-Made Leafy Greens | Galicia | R&D in biotechnology and agriculture. Vegetable, roots, tubers, cereals, fungi and any other plant species. |
| The Blue Box Biomedical Solutions | Catalonia | Development of a portable device to detect breast cancer biomarkers. |
| Tramontane Therapeutics | Catalonia | Development of treatments for high-prevalence metabolic and neurodegenerative diseases that affect a large population of patients, using gene therapy. |
| Vitala Technologies | Catalonia | Development of an analysis of efficient, ethical treatment for drug discovery and personalised medicine. Using various types of technology: Organ-on-Chip (OoC) and advanced MRI tools. |
| Viva In Vitro Diagnostic | Murcia | Development of new compact diagnostic devices that allow for better stratification of sepsis in patients at hospitals. |
| Wharton Cells | Catalonia | Research with Wharton's jelly mesenchymal stem cells, given their multilineage potential. |

Table 4.3. Companies devoted to biotechnology that began working in 2021. Source: AseBio, with collaboration from IDEA Agency, CEEI Asturias, Bioibal, Sodercan Group, Oficina de Transparencia y Buen Gobierno de la Junta de Castilla La Mancha, Albacete Technology Park, 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.

# Advancing towards decarbonisation and the circular economy

CENER | CENTRO NACIONAL DE ENERGÍAS RENOVABLES
ADItech

SUSTAINABLE DEVELOPMENT GOALS

7 AFFORDABLE AND CLEAN ENERGY

Caption: Semi-industrial bioreactor located in the BIO2C Biochemical Processes Unit at CENER.

CENER, the National Renewable Energy Centre, has been doing applied research and providing technological support for energy companies and institutions for over 20 years in all areas related to renewable energy, including storage, smart networks, big data, decarbonisation of industry, the circular economy and smart cities, among others. This work strives to contribute to achieving the main Sustainable Development Goals, such as ensuring access to affordable, reliable, sustainable and modern energy for all (SDG 7).

One of the main pillars is applied research in biomass, and specifically in developing and optimising production of bioproducts, solid biofuels, advanced liquid and gas biofuels, and aspects of biorefinery and its technical, economic and environmental assessment.

To do so, CENER has a biomass laboratory (where biomass and biofuels are characterised and processes are developed on a laboratory scale), as well as a Biorefinery and Bioenergy Centre (BIO2C www.bio2c.es).

At BIO2C, a facility for semi-industrial pilot scale testing, these processes and technologies are developed, integrating various valorisation pathways, as a bridge between the lab and industrial scale-up. These facilities offer pretreatment, hydrolysis and fermentation units, pyrolysis and hydrothermal liquefaction reactors to demonstrate the valorisation of various biomasses.

To do so, CENER has been working for over a decade with the biotech industry in Spain and abroad, guiding companies through developing and validating their biotechnology product or process to boost their commercialisation success rate quickly, more affordably and with specialised support. Plus, internal R&D projects are carried out with a significant impact on SDG 7, such as development of:

- Technology to produce advanced biofuels from residual biomass and biowaste without affecting food production. Biological $CO_2$ methanation to produce biomethane to put into the grid or for vehicles.

- Torrefaction of solid biofuels to replace solid fossil fuels in high-temperature industrial kilns (cement, steel, lime, magnesite, etc.).

- Chemical recycling of mixed plastic waste to produce renewable fuels and chemical products from recycled carbon.

- Technology to produce bio-aromatics from lignin to produce bio-based phenols for use as antioxidants, UV filters, antimicrobials and to replace basic fossil phenols.

- Production of bio-fertilisers from biowaste, reducing dependence on fossil-based nitrogenous fertilisers and eutrophication of aquatic systems.

- Biodegradable bioplastics from biowaste.

The Sustainable Development Goals in general, and particularly production of affordable, non-polluting energy, taking into account efficient energy use, are a benchmark in the CENER research and development process, with the aim of contributing the new technological solutions needed for a sustainable energy transition and helping fight climate change.

Goizeder Barberena, Biomass Strategy and Business Development Manager

# ENVIRONMENTAL CONDITIONS 05

# 5.1 How society sees our work

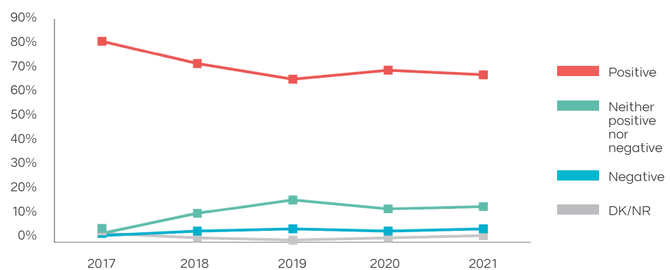
Over the past decade, we've seen how technological and scientific advances come about at breakneck speed and this, along with phenomena like misinformation, can make some people feel scared or even reject the solutions. In 2020, we saw how the impact of the pandemic and the quick response from science led to an improvement in public perception of innovation. This year, the trend continued, although the increase was slightly less than in 2020. Science and innovation, in particular that done in our sector, play a key role in resolving the social and environmental challenges of a sustainable, resilient growth model.

So, we need people to be aware of the social benefits of work in biotechnology.

**The positive perception of innovation dropped, but is still more positive than before the pandemic.**

The survey on Social Perception of Innovation in Spanish society COTEC conducted in March 2022 showed that 75% of those surveyed consider innovation a positive thing. Although this is down from 2020, it is still above the pre-pandemic results, which showed a 73% approval rate.

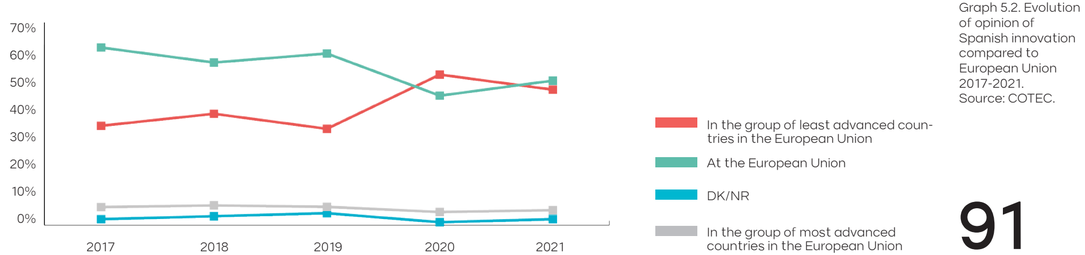
Graph 5.1. Evolution of opinion of innovation 2017-2021. Source: COTEC.





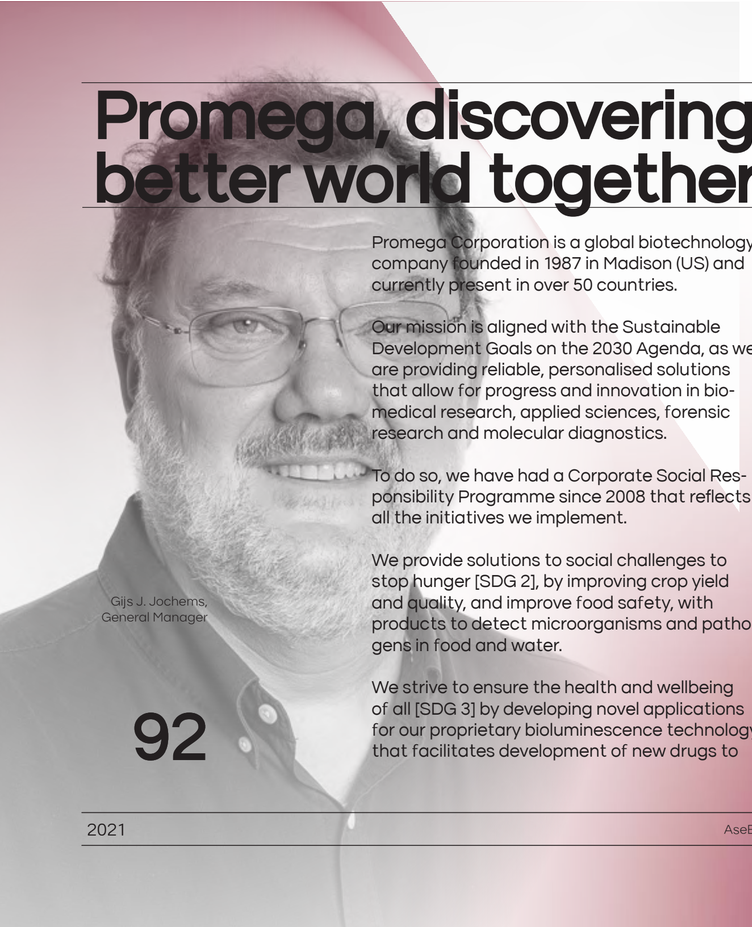

**The perception of Spanish innovation compared to Europe improved.**

In 2021, 48% of Spaniards put innovation from our country at the EU average, which was an improvement from 43% in 2020. Likewise, while 50.4% of those surveyed in 2020 put innovation from Spain among the least advanced countries in the EU, in 2021 this percentage dropped to 45%. So, this confirms the improvement in social perception of innovation in our country compared to those around us. (Graph 5.2).




Graph 5.2. Evolution of opinion of Spanish innovation compared to European Union 2017-2021. Source: COTEC.

# Promega, discovering a better world together



Gijs J. Jochems,
General Manager

Promega Corporation is a global biotechnology company founded in 1987 in Madison (US) and currently present in over 50 countries.

Our mission is aligned with the Sustainable Development Goals on the 2030 Agenda, as we are providing reliable, personalised solutions that allow for progress and innovation in biomedical research, applied sciences, forensic research and molecular diagnostics.

To do so, we have had a Corporate Social Responsibility Programme since 2008 that reflects all the initiatives we implement.

We provide solutions to social challenges to stop hunger [SDG 2], by improving crop yield and quality, and improve food safety, with products to detect microorganisms and pathogens in food and water.

We strive to ensure the health and wellbeing of all [SDG 3] by developing novel applications for our proprietary bioluminescence technology that facilitates development of new drugs to diagnose diseases more quickly and effectively, facilitating prevention and control of infectious diseases.

We work actively to promote quality education [SDG 4] through collaborations with various universities and research centres that run training programmes of scientific excellence for young people.

Some examples include the BATX2LAB mentoring programmes, in collaboration with the Barcelona Science Park, and the STEM job guidance activities organised by the Complutense University of Madrid and the Autonomous University of Madrid.



Promega

SUSTAINABLE DEVELOPMENT GOALS

8 DECENT WORK AND ECONOMIC GROWTH

As a global company, we recognise the individual value of people and are committed to creating and maintaining an environment that respects ethnic, cultural and gender diversity [SDG 5].

We ensure the availability and sustainable management of water [SDG 6] with automated workflows to detect SARS-CoV-2 in wastewater.

Our commitment to the environment involves using reliable, clean, renewable energy in our facilities [SDG 7 and SDG 11]. Our vision for 2030 has three key points: Cutting waste by 30%, emissions by 50% and water use by 30%. *

To this end, we've already developed several initiatives:

Ship Ambient project to make packages smaller and lighter, using more efficient shipping methods that don't require dry ice.

• Smart stock-on-site storage systems.

• Installing solar panels to power our facilities.

• Recycling protective garments, shrink film, plastic bottles, pipette-tip boxes and electronic waste.

• Rainwater-collection systems to conserve water at production centres.

We are a highly innovative company [SDG 8 and SDG 9] and invest 10% of our annual profits in R&D.

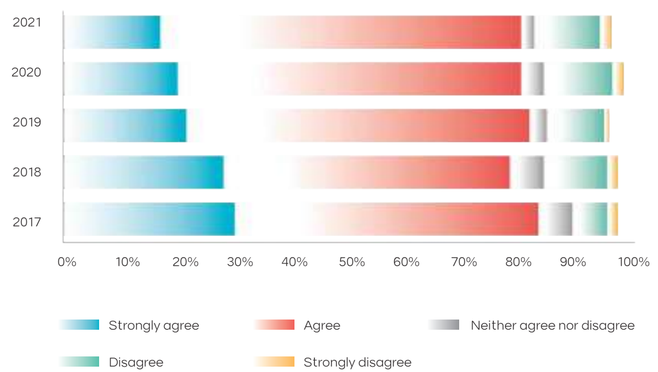
Some examples include our collaborations on EU-OPENSCREEN and SDDN.

We take part in preserving marine resources, biodiversity and long-term wildlife conservation [SDG 14 and SDG 15] by providing financial support for several foundations that are developing advanced molecular techniques (MBL, Revive&Restore Catalyst). Promega forges partnerships with stakeholders in the system [SDG 17] and takes an active role in collaborations with public and private bodies.

Graph 5.3. Evolution of opinion of deficiency of public R&D investment 2017-2021. Source: COTEC.

**The social perception of the deficiency of public investment in innovation has grown.**

While 78% of those surveyed in 2020 believed public investment in R&D was insufficient, that figure rose to 82% in 2021. Looking at the breakdown of these figures, in 2020 27% highly agreed that public investment in R&D was insufficient, but this figure was 29% in 2021. Likewise, 50% agreed with this affirmation and in 2021 it was 53%.



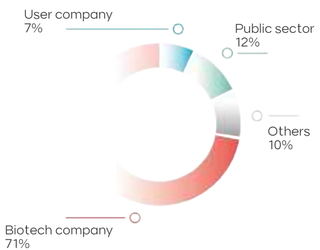



# 5.2 How the biotechnology sector sees its work environment

In the 2019 AseBio Report, we started a new way of assessing how the sector perceives its work environment. We asked AseBio members to rate a series of factors based on whether they contributed positively or negatively to the development of the biotechnology sector in Spain.

This year's survey had 105 participants, 71% were biotechnology companies, followed by organisations in the public sphere with 12%, companies that use biotechnology with 7% and other types of organisations, 10%.

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 5.4. Breakdown of participants in the perception of environment survey by type of organisation.

**Public opinion of biotechnology, most highly rated factor.**

In 2020, the most highly rated factor was, for the first time, the public opinion of biotechnology. As we saw in the 2020 edition of this Report, this is undoubtedly due to Covid-19. The training level of workers and demand for more sophisticated and high value-added products are also highly valued factors.

The factors with over 2.5 are rated positively. As table 5.1 shows, 16 of the 21 factors are rated positively. The elements that stand out in this group include public opinion of biotechnology, training level of workers, demand for more sophisticated and high value-added products, number of bioentrepreneurs, qualified personnel and creation of new national businesses. On the other hand, the lowest rated factors include the regulatory framework, time to profitability, public administration, cost of innovation and the economic situation.



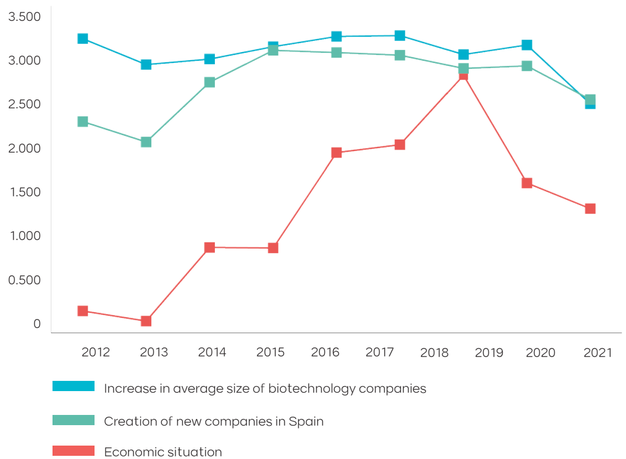
| Factors | 2021 | 2020 | Average 2000-2021 | % Variation 2020-2021 |
|---|---|---|---|---|
| Public opinion of biotechnology | 3.533 | 3.667 | 2.178 | -4% |
| Employee training level | 3.204 | 3.283 | 3.916 | -2% |
| Demand for more sophisticated products with higher value added | 3.196 | 3.190 | 3.314 | 0% |
| Number of bioentrepreneurs | 3.192 | 2.932 | 2.233 | 9% |
| Qualified personnel | 3.173 | 3.233 | 2.050 | -2% |
| Creation of new companies in Spain | 3.106 | 2.750 | 2.743 | 13% |
| Increase in average size of biotechnology companies | 3.099 | 2.783 | 2.676 | 11% |
| Internationalisation process | 3.088 | 2.933 | 1.285 | 5% |
| Mergers/acquisitions/strategic alliances | 3.060 | 2.867 | 2.862 | 7% |
| Information on the biotechnology market | 3.048 | 3.133 | 2.213 | -3% |
| Cooperation with universities/IPOs and technology centres | 3.048 | 3.050 | 2.171 | 0% |
| Specialised suppliers (consultants, lawyers, etc.) | 3.010 | 2.932 | 2.151 | 3% |
| Specialised facilities (technology centres, auxiliary services centres, etc.) | 3.010 | 2.800 | 2.133 | 7% |
| Market-orientated nature of the public technology offering | 2.871 | 2.810 | 2.328 | 2% |
| Attracting international companies | 2.808 | 2.583 | 2.759 | 9% |
| Access to funding | 2.549 | 2,373 | 1.099 | 7% |
| Regulatory framework | 2.376 | 2.390 | 0.380 | -1% |
| Time to profitability | 2.375 | 2.390 | 2.172 | -1% |
| Public administration | 2.356 | 2.203 | 0.823 | 7% |
| Cost of innovation | 2.330 | 2.220 | 2.179 | 5% |
| Economic situation | 2.176 | 1.950 | 2.223 | 12% |

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

**The rating for the biotech industrial fabric has risen but the economic situation is still seen as a barrier.**

Graph 5.5 shows the evolution of the factors that saw the biggest change from the previous year. The economic situation, although its rating improved, continues to be seen as the main barrier to development for biotechnology companies.

The other two factors with the biggest variation are creation of companies in Spain and the increase in average size of companies in Spain. Both were rated more highly, up 13% and 11% respectively. These factors, in addition to being interrelated, point to the sector's improved perception of the development of the business fabric in our country.




Graph 5.5. Evolution of economic situation, increase in average size of biotechnology companies and creation of new companies in Spain 2012 - 2021. Source: AseBio.

# Madrid Science Park, key stakeholder in the biotechnology entrepreneurship ecosystem

The Madrid Science Park Foundation (FPCM), an essential stakeholder in the ecosystem supporting the biotechnology sector, is aligned with the Sustainable Development Goals (SDG) on the United Nations 2030 Agenda (UN, 2015), specifically number 9: to build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.

So, in 2021 the Park incubator was home to 35 companies working in the life sciences and chemistry, which is 41% of all the companies that are associated with our institution.

The mission of the FPCM is to create a space with facilities of excellence and professional services for entrepreneurship, innovation and funding, for projects like biotechnology companies that need space and support when getting off the ground.

By furnishing pre-equipped labs, shared-use science equipment and technicians to help prepare samples and experiments, the Park has positioned itself as an essential stakeholder to ensure the success of this type of company, which by nature requires large investments and longer development and incubation times. The Park's infrastructures and services allow biotechnology companies to concentrate their efforts on research and business development, optimising their resources so they can be as competitive as possible on the market.

Furthermore, the FPCM leads acceleration and scale-up programmes to encourage scientific entrepreneurship. One of these programmes, CaTaPull Madrid, was launched with support from the Madrid City Council to address the challenges and opportunities today and to promote entrepreneurship in science and technology with a high impact on the city of Madrid. The 2021 edition of this programme featured several scientific business projects from different fields of the life sciences and biotechnology, such as oncology therapies, microencapsulated drugs, organ-on-a-chip solutions, cellular immunotherapy and rehabilitation support technology.

This programme accelerated a total of six business projects, two of which have set up a company.

Another scale-up programme is CaTaPull UP, specially for deep-tech start-ups with high potential for growth, which aims to promote high-impact entrepreneurship. To do this, the programme provides direct, personalised guidance for participating companies, focused on improving four key areas of business: team, funding, product and market. There are nine FPCM companies currently taking part in the first edition of this programme, some of which are developing solutions for the healthcare sector: medical devices and artificial intelligence applications for drug development.

Plus, the Madrid Science Park, as a member of the Enterprise Europe Network (EEN), offers a new sustainability service for companies, aligned with the work priorities of the European Commission (EC) for the coming years. This service aims to help companies implement a personalised plan covering various issues related to sustainability, based on a self-diagnosis questionnaire using a simple methodology to get familiar with the 2030 Agenda and have companies see for themselves the advantages

Pilar Gil Ibáñez,
CEO, Madrid Science Park Foundation

# RESULTS

# 06

# 6.1 Production of scientific knowledge

**Spanish biotechnology makes up 2.8% of global production in this area and is cited 30% more than the global average.**

In 2020, scientific production in biotechnology made up 1% of all scientific production in Spain, with 1,068 papers, and 2.8% of global scientific production in this area (graph 6.1).

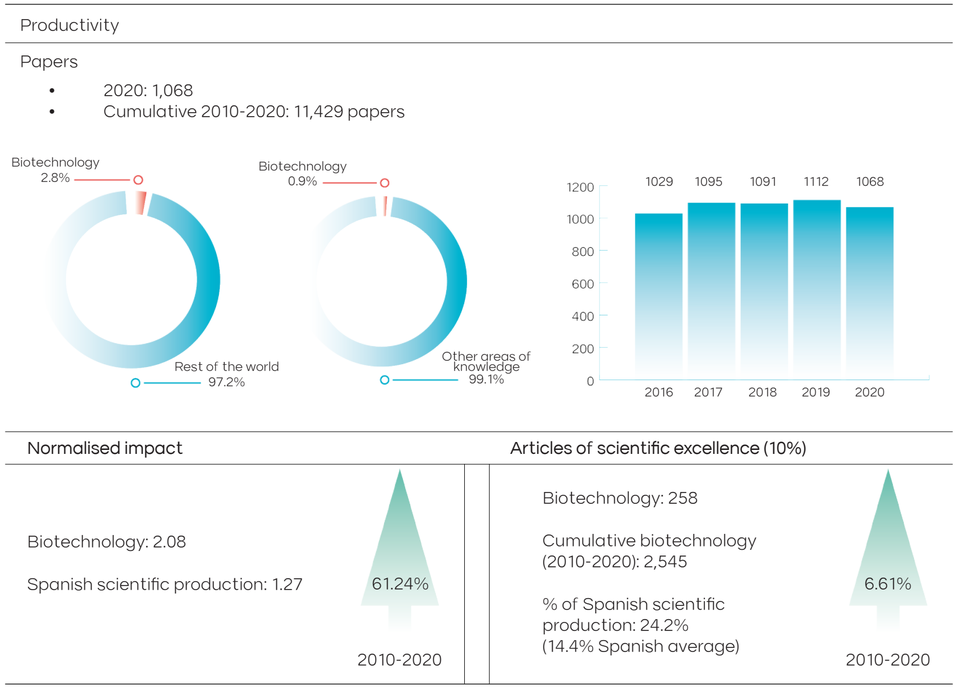
The normalised impact of biotechnology scientific production in Spain was 1.3 in 2020. This means that Spanish scientific production in biotechnology was cited 30% more than the global average in this area.

The quality of research in biotechnology can be judged by observing the number of documents published in high-impact journals. In 2020, of the 1,068 scientific papers produced by Spanish institutions in biotechnology, 681 were published in journals ranked in the first quartile (Q1) by impact factor, or 64.5%, 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 258 documents of excellence in biotechnology in 2020, 24.2% of all papers published in this area.

This percentage of excellence in biotechnology is well above the Spanish average for excellence.






Graph 6.1. Bibliometric overview of Spanish research in biotechnology, 2010-2020. Source: FECYT, from data on the tool SciVal-SCOPUS, consulted in April 2022.

# Sustainable social, environmental and economic value

LEITAT managing technologies

SUSTAINABLE DEVELOPMENT GOALS

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

Leitat is a Technology Centre of Excellence whose mission is to manage technology to create and transfer sustainable social, environmental, economic and industrial value to companies and organisations through research and technological processes. Established in 1906, the centre has a team of more than 500 professionals and is recognised by the Ministry of Science and Innovation.

Through dynamism and proximity, Leitat strives to generate knowledge and transfer it to the productive sector in a variety of fields and arenas: development of new materials, eco-sustainable production, health, interconnectivity and digitalisation of industry, green energy and energy efficiency, among others. In the circular economy and bioeconomy, Leitat is working to speed up the transition towards an economic development model that doesn't compromise our future or that of the planet, making it clear that competitiveness must also apply to efficient use of resources, climate neutrality and social wellbeing.

The SDGs are a guide, a road map that allows companies and organisations to identify the social, economic and environmental impact, and to contribute value to society and strengthen relationships with interest groups.

This is why Leitat has set up its SDG Office, to identify which goals each research project contributes to, integrate them into the organisation's strategy and communicate them internally and externally.

The bioeconomy and biotechnology play a key role in achieving Goal 12 to ensure sustainable consumption and production patterns. Leitat's strategy includes incorporating both of these into the environmental and industrial areas to have an impact on key sectors like agrifood, power and chemicals. Research into new sources of biomass to obtain raw materials, materials, ingredients or products from biological sources is one of the key focal points of this transition. Alternative sources like insect or marine biomass, microalgae or organic byproducts help reduce our dependence on fossil resources under current production models. Additionally, applying biotechnology for functionalisation or conversion provides a sustainable alternative to conventional processes in a comprehensive biorefinery strategy. Obtaining high-quality biopolymers, biofertilisers, feed or food ingredients are some examples.

In the field of fuels, Leitat is researching bio-electrochemical processes based on electroactive microorganisms, obtaining products like biomethane, bioethanol and even green hydrogen from renewable materials.

Finally, in line with the centre's strategy to reduce waste generated, Leitat is researching applications for enzymes or microbial consortia to biodegrade and valorise various sorts of waste, mainly polymeric in origin.

In all these projects, in line with SDG 12, Leitat prioritises respect for the environment and the people who produce these services and products.

Responsible consumption means covering our needs, taking into account that our actions have an impact and we can make this as beneficial as possible.

Julia Garcia, Head of Circular Economy, LEITAT.

## Spain holds on to its eighth place global ranking in number of papers in biotechnology.

Spain holds on to its eighth place ranking in number of papers in biotechnology. China and the United States have the highest production in terms of number of documents in this area. The proportion of scientific production in biotechnology to general scientific production is the highest in India and South Korea.

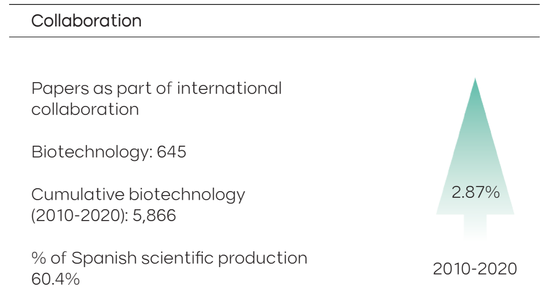
Table 6.1 Top 10 countries in scientific production in biotechnology. 2010-2020. Source: FECYT.

| Ranking | Country | Number of documents | Number of documents in biotechnology | Scientific production in biotechnology as a percentage of total scientific production (%) | Normalised impact of biotechnology | Scientific production in biotechnology in high-impact journals (Q1) (%) | Scientific production in biotechnology of excellence (%) | Scientific production in biotechnology of excellence (%) |
|---|---|---|---|---|---|---|---|---|
| 1 | China | 5,566,362 | 80,161 | 1.44% | 1.18 | 48.9% | 19.8% | 23.9% |
| 2 | United States | 6,300,625 | 67,877 | 1.08% | 1.55 | 71.2% | 24.6% | 41.9% |
| 3 | India | 1,463,337 | 35,071 | 2.40% | 0.66 | 15.5% | 9.5% | 13.8% |
| 4 | Japan | 1,383,307 | 21,136 | 1.53% | 0.85 | 36.7% | 9.5% | 28.6% |
| 5 | Germany | 1,728,629 | 21,426 | 1.24% | 1.41 | 65.5% | 21.9% | 51.0% |
| 6 | South Korea | 846,282 | 20,810 | 2.46% | 0.95 | 34.7% | 13.7% | 24.9% |
| 7 | United Kingdom | 1,836,349 | 17,026 | 0.93% | 1.52 | 69.0% | 24.4% | 62.8% |
| 8 | Spain | 920,121 | 11,429 | 1.24% | 1.41 | 62.3% | 22.3% | 51.3% |
| 9 | France | 1,187,601 | 11,127 | 0.94% | 1.43 | 67.5% | 21.3% | 61.1% |
| 10 | Italy | 1,096,467 | 11,200 | 1.02% | 1.37 | 57.7% | 21.6% | 47.2% |



## 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 60.4% of the total in 2020, with 645 papers. The percentage of Spanish scientific production in biotechnology published as part of an international collaboration was above the Spanish average for every year in the period analysed.



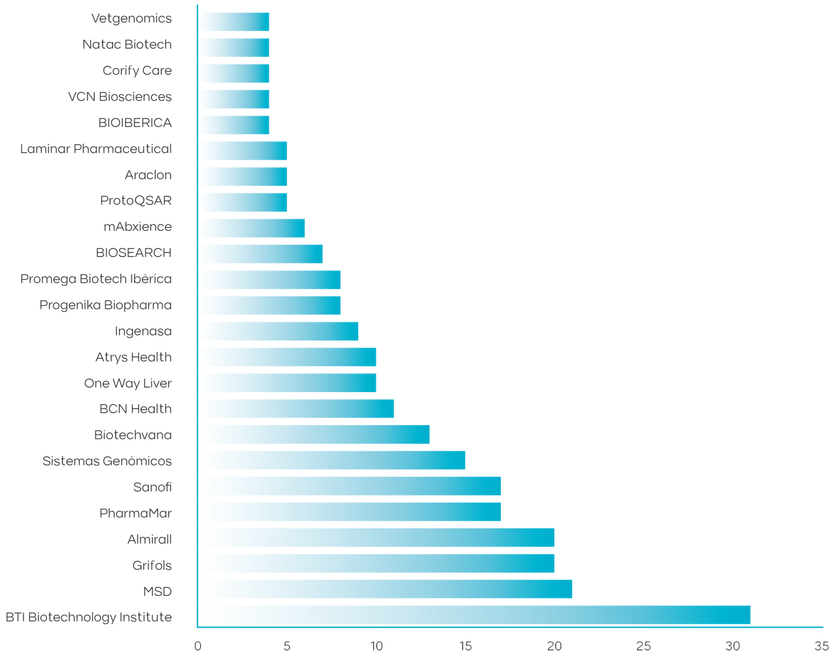

Graph 6.2. Collaborative papers. Source: FECYT.

## Biotechnology companies increased scientific production efforts by nearly 50%.

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 2021, these companies published 304 papers, which was 95 more than in 2020, up 45%. The companies with the most publications (graph 6.3) include BTI Biotechnology Institute first with 31, MSD with 21, Grifols and Almirall with 20 each, and PharmaMar and Sanofi, both with 17. These are followed by Sistemas Genómicos with 15 and Biotechvana with 13.

Additionally, although not included in this ranking, the publications by AseBio members are worth noting: Health Research Institute Hospital La Fe with 1,385, Centre for Genomic Regulation with 322, IRB Barcelona with 175, Centre for Plant Biotechnology and Genomics with 80, Fundación Jiménez Diaz with 59, the Biopharma group at University of Santiago de Compostela with 30, Fundación MEDINA with 10, the Spanish Bank of Algae with 6 and Ainia with 5.




Graph 6.3. Number of science papers published in 2021 by AseBio member companies. Source: AseBio.



# 6.2 Technological innovation

**The biotechnology sector continues to patent mainly in international arenas.**

We have counted 504 patent applications and 126 patents granted in Spain in 2021. Patents with a Spanish priority claim or stakeholder in the biotechnology sector were identified through the various patent offices (OPEM, EPO, USPTO, JPO and WIPO).

| Patents issued | OEPM | EPO | USPTO | JPTO | PCT | TOTAL |
|---|---|---|---|---|---|---|
| Applications | 78 | 196 | 34 | 3 | 193 | 504 |
| Granted | 25 | 69 | 25 | 7 | (NA) | 126 |
| TOTAL | 103 | 265 | 59 | 10 | 193 | 630 |

Table 6.2. Number of patent applications and patents granted to Spanish biotechnology organisations (2020). Source: ClarkeModet – FPCM.

As has happened since 2013, the 2021 data again shows that the sector continues choosing to protect its innovation mainly through the European Patent Office (EPO) and with international PCT patents (table 6.2).

The majority of the sector has chosen to protect innovations on a European level, with 265 patents, and 193 through PCT patents, while there were 103 patents issued through the Spanish Patent and Trademark Office, more than the previous year.

Graph 6.4. Biotechnology patent applications (2021). Source: ClarkeModet – FPCM.


Graph 6.4 shows that the highest percentage of patent applications in the biotechnology sector were filed with the European Patent Office, 39%, followed by 38% through international PCT patents, 15% through the Spanish Patent and Trademark Office, 7% with the United States Patent and Trademark Office and 1% with the Japan Patent Office.

Graph 6.5. Biotechnology patents issued 2021. Source: ClarkeModet - FPCM.


The patents granted (graph 6.5) follow the same trend as the applications. 55% of patents were issued by the European Patent Office, 20% each by the Spanish Patent and Trademark Office and the United States Patent and Trademark Office, and 5% by the Japan Patent Office.

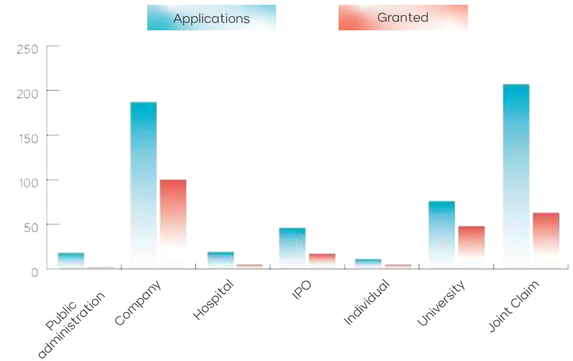
**The biotechnology sector patents in collaboration, with nearly 200 joint patent applications.**

Joint applications, or collaborative patenting, with 208 applications and 46 patents granted, is the main pathway for protecting biotechnology innovations. As we can see in graph 6.6, companies continue to be the main applicants, with 133 applications and 52 patents granted.



**For over a decade, European and international patents have been increasing, and Spanish patents once again decreased.**

As we've seen for over 10 years, the sector chooses to patent in international and European arenas.




Graph 6.6. Holder of patent applications and patents granted (2021). Source: ClarkeModet – FPCM.

Graph 6.7 shows that the patent applications submitted to the Spanish Patent and Trademark Office have decreased steadily, while PCT or European Patent Office applications have risen. Applications to the US or Japanese patent offices, except for an uptick in 2012, have held stable in recent years.

If we compare patent applications submitted to the European Office in 2009 and 2021, we see a six-fold increase. While there were 33 applications in 2009, 2021 saw a total of 196.

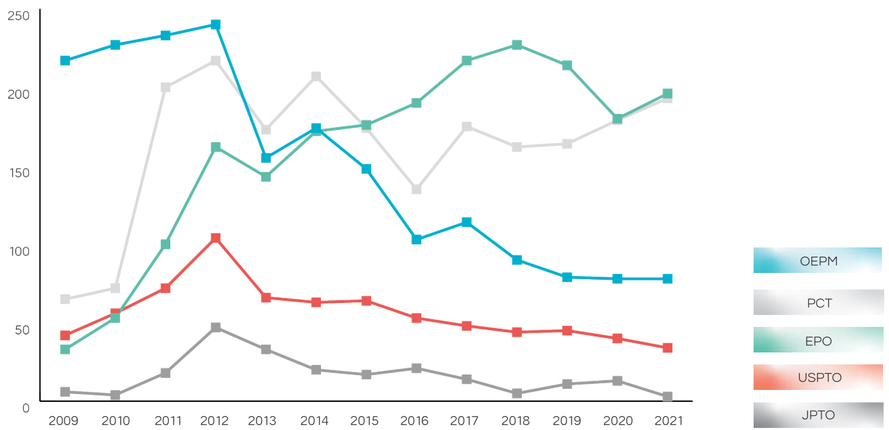
In the case of international patents through the Patent Cooperation Treaty (PCT), while over 10 years ago there were only 65, in 2021 there were more than 190 applications.

Protection through the Spanish Patent and Trademark Office dropped again, with the same number as in 2020: 78.

In collaboration with:

FUNDACIÓN Parque Científico de Madrid

Clarke Modet +




Graph 6.7. Trend of patent applications (2009-2021). Source: ClarkeModet – FPCM.



# 6.3 Advances in development

BIOHEALTH

**Advances in studies:**

**Ability Pharmaceuticals** announced the first patients recruited for a phase IIb clinical trial on ABTL0812 + FOLFIRINOX as a first-line therapy for advanced pancreatic cancer simultaneously in the US and Europe.

**Almirall** announced that Lebrikizumab, an IL-13 inhibitor, significantly improved the severity of the disease in people with atopic dermatitis (AD).

**Amgen** announced that Sotorasib in combination with panitumumab showed promising efficacy and safety in patients with colorectal cancer with a KRASG12C mutation and the CodeBreak phase II trial showed an average global survival rate of 12.5 months in patients with non-small-cell lung cancer (NSCLC) treated previously.

Plus, the company presented new data from the FIGHT phase II trial that is studying bemarituzumab added to chemotherapy compared to just chemotherapy as a first-line treatment for HER2-negative patients with advanced gastric cancer or gastroesophageal junction cancer.

**aptaTargets** completed the first part of the APRIL study, a phase Ib/IIa clinical trial on ApTOLL, an immunomodulatory and anti-inflammatory drug that can reduce brain damage in stroke victims.

**Archivel Farma** announced the beginning of the StriTuVaD phase II clinical trial on the RUTI® vaccine as an adjuvant to chemotherapy to fight tuberculosis (TB), recruiting the first patient for the trial. The company also announced that RUTI® will be administered in the CONSTAN study, approved by the Spanish Agency of Medicines and Medical Devices (AEMPS), to study its efficacy in patients with pulmonary tuberculosis as a co-adjuvant therapy to the antibiotic administered.

**Biolan Health** developed and validated a new rapid antigen test from a nasal swab to detect the SARS-CoV-2 virus.

**Biosfer Teslab** began a study on different types of cancer by analysing metabolites in urine, blood and/or tissue.

**Ferrer** announced the results of its phase III trial to assess the safety and efficacy of the experimental drug FNP122 in treating amyotrophic lateral sclerosis (ALS).

**Genómica,** announced the validation of its qCOVID-19 Respiratory COMBO kit to detect SARS-CoV-2 in saliva samples.

**Grifols** began commercialisation of HyperHEP B®, a new formulation of its human hepatitis-B immune globulin (HBIg) for prophylaxis post-exposure to the hepatitis-B virus.

The company announced positive results for its phase III clinical trial (treatment of hospitalised patients with coronavirus immune globulin - ITAC).

And began a new clinical trial in Spain to assess the safety and efficacy of a new drug based on immune globulin, Gamunex®-C, which contains polyclonal SARS-CoV-2 antibodies from plasma donors who have had the disease.

**Highlight Therapeutics** announced positive results for a phase II study on intra-tumour administration of BO-112 with pembrolizumab in patients with advanced melanoma.

**Histocell** successfully completed the first phase of the clinical trial on its cell-therapy drug HC016 to treat respiratory distress caused by Covid-19.

**Minoryx** presented new data from its phase II/III clinical trial, ADVANCE, which highlighted a decrease in progression of brain damage and risk of developing cerebral ALD in patients with AMN.

**Oryzon Genomics** presented positive efficacy data from its phase IIa ALICE trial that is studying iadademstat in combination with azacitidine in patients with acute myeloid leukaemia (AML).

Plus, the company announced the first patient recruited for its phase IIb clinical trials on vafidemstat in patients with schizophrenia and borderline personality disorder (BPD).

It also presented final data on vafidemstat's capacity to reduce inflammatory response in patients with multiple sclerosis from the SATEEN phase II trial and from the ESCAPE study, the company presented preliminary data on vafidemstat's capacity to reduce inflammatory response in patients with Covid-19.

Finally, the company announced that the United States Food and Drug Administration (FDA) has granted orphan drug status to its first LSD1 inhibitor, iadademstat, to treat patients with acute myeloid leukaemia.

**OWL Metabolomics** presented results from its studies on diagnosis and assessment of cardiovascular risk in NASH.

**Palobiofarma** announced positive results from its phase IIa clinical trial on the use of PBF-677 to treat patients with mild to moderate ulcerative colitis.

**Peptomyc** announced the first patient recruited for its phase I/II study on OMO-103, its anti-MYC compound, to treat advanced solid tumours.

**PharmaMar** announced the first patient recruited for its phase I/II study on OMO-103, its anti-MYC compound, to treat advanced solid tumours.

**Specipig** announced its participation in a ground-breaking study on the safety of hiPSC-RPE cells to treat geographic atrophy.

**Sylentis** began the first phase I trial on SYL1801 to treat and/or prevent choroidal neovascularisation, a common cause of retinal conditions such as age-related macular degeneration (AMD) and diabetic retinopathy.

**Takeda** and Savana have developed a clinical model using artificial intelligence to identify predictive factors for future outbreaks in patients with Crohn's disease.

**ZeClinics** presented the results of the ZF-Glioma project, which identified three new tyrosine kinase inhibitors with potential to treat gliomas.

**Zymvol** launched ZYMEVOLVER 2.0, a new update to its in silico enzyme-engineering software.

**VCN Biosciences** announced publication of data from the P-VCNA-002 clinical trial on patients with pancreatic cancer who received VCN-01 by inter-tumour administration.

## Regulatory authorisations:

**Almirall** announced in summer 2021 it had gained approval from the European Commission and United Kingdom

Medicines and Healthcare products Regulatory Agency for Klisyri® for topical treatment of actinic keratosis (AK) on the face and scalp in adults.

Plus, the company received FDA approval for Seysara ® (sarecycline), a tetracycline-derived antibiotic to treat inflammatory lesions of non-nodular moderate to severe acne vulgaris, produced at the plant in Sant Andreu de la Barca.

**Grifols** achieved EU certification for conformity assessment based on a quality management system and on assessment of technical documentation, as per the In Vitro Diagnostic Medical Devices Regulation (IVDR) from the notified bodies TÜV SÜD Product Service and BSI, for its immunohaematology products for blood typing and detecting anti-erythrocyte antibodies.

Plus, the company announced that the Japanese Ministry of Health, Labour and Welfare granted approval for manufacturing and commercialising Lynspad™ in Japan (intravenous infusion of 100 mg), an alpha-1 protease inhibitor to treat severe alpha-1 antitrypsin deficiency (AATD).

The European Commission (EC) approved **mAbxience's** MB02 biosimilar to Avastin® (bevacizumab) for use in Europe to treat carcinoma of the colon or rectum, breast cancer, non-small-cell lung cancer, renal-cell carcinoma, epithelial ovarian, fallopian or primary peritoneal cancer, and cervical cancer.

**Life Length** was granted AEMPS authorisation for its prostate cancer diagnostic test, PROSTAV® and CE marking for its use and sale.

**PharmaMar** announced Zepzelca® (lurbinectedin) has been approved to treat metastatic small-cell lung cancer in the United Arab Emirates, Australia, Singapore and Canada.

The company, in addition to presenting new results for Yondelis® (trabectedin) in patients with metastatic or inoperable leiomyosarcoma, also announced its licensing partner, Specialized Therapeutics Asia, has been granted approval to commercialise the drug by the Australian Therapeutic Goods Administration.

Finally, the company received AEMPS authorisation to begin the phase III NEPTUNO clinical trial to determine the efficacy of Aplidin® (plitidepsin) to treat patients in hospital with moderate Covid-19 infections.

Plus, it received AEMPS authorisation to begin the clinical trial in the United Kingdom and presented the final results of its APLICOV-PC clinical trial, also on Aplidin®, to treat adult patients with Covid-19 who require hospitalisation, demonstrating clinical efficacy and compliance with safety goals.

The EC approved **Sanofi Genzyme's** isatuximab in combination with carfilzomib and dexametasone (Kd) to treat adult patients with relapsed multiple myeloma who have received at least one prior treatment. Plus, it presented Cablivi (caplacizumab), the first drug to treat the rare disease acquired thrombotic thrombocytopenic purpura, based on nano-antibody technology, a new generation of biodrugs that represent therapeutic innovation and progress with their great potential for application in multiple areas (respiratory, cardiovascular, inflammatory, musculoskeletal system and cancer).

**Sobi** and Apellis Pharmaceuticals announced EC approval for Aspaveli® (pegcetacoplan), the first targeted C3 therapy, to treat adults with paroxysmal nocturnal haemoglobinuria who remain anaemic for at least three months after treatment with C5 inhibitors.

**SOM Biotech** was granted FDA orphan drug designation for SOM3355, a drug in clinical development to treat chorea associated with Huntington's disease (HD).

**Sylentis** received FDA authorisation to begin the SYL1001_V phase III clinical trial with the ophthalmic solution (eye drops) tivanisiran to treat dry eye associated with Sjögren's syndrome.

**Tecbiocel** was granted AEPMS accreditation as a pharmaceutical laboratory to manufacture medications for human use and GMP certification.

**VIVEbiotech** obtained AEMPS authorisation to manufacture experimental drugs to be used for in vivo clinical trials.

### Expanded capacities:

**Grifols** and the National Service Projects Organisation of Egypt inaugurated the first integrated plasma-supply platform in Africa.

**Life Length** opened its own clinic for Covid-19 testing, which has also become one of the most highly rated in Spain for its excellence.

**mAbxience** announced it has expanded its manufacturing capacity for biosimilars and CDMO services with an ABEC 4,000-litre single-use bioreactor.

**Operon** moved its production plant to Zaragoza to optimise production and increase its business lines.

**Proteos Biotech** announced the inauguration of a biopharmaceutical plant in Barcelona.

**Reig Jofre's** Bioglan subsidiary in Sweden and Stada invested €3 million to expand the Bioglan facilities, adding a latest-generation production line for a patented combined therapy for Parkinson's disease.

**Takeda**'s production plant in Tres Cantos, Madrid has tripled the global production capacity of the first allogeneic cell therapy (from donors), indicated for patients with Crohn's disease who suffer from complex perianal fistulas.

**VIVEbiotech** inaugurated its new headquarters at the Gipuzkoa Science and Technology Park, increasing its capacity to produce viral vectors thirty-fold and optimising manufacturing processes.

## AGRIFOOD

**Algenex,** and veterinary drug company FATRO announced that the European Commission and the United Kingdom Veterinary Medicines Directorate authorised commercialisation of the FATROVAX RHD veterinary vaccine for rabbit haemorrhagic disease in the European Union and United Kingdom. This approval validated the use of Algenex's Cris-Bio® technology to produce recombinant biological products and biocomponents.

**Aquilón** registered Brucellin Aquilón with the EMA, an intradermal immunological test to diagnose brucellosis in swine.

**Biobérica** announced positive results from a trial with Terramin® Pro in various types of soil, showing it boosted soil health. It is the company's first prebiotic designed to stimulate local microbiota in the soil and boost crop fertilisation, reducing dependence on chemical fertilisers.

**Biorizon Biotech** announced an expansion of its facilities, with triple the current space and double its production capacity in Almeria.

**Biosearch** was granted approval by the Brazilian Health Regulatory Agency to commercialise two of its probiotic strains, *Lactobacillus fermentum* CECT5716 LC40® and *Lactobacillus coryniformis* CECT5711 K8, to boost the immune system.

**Eurofins Ingenasa** launched SENSIStrip Gluten Kit, a tool to detect gluten in food, environmental samples and rinse water, and the ELISA Test to detect African swine fever.

**Ingulados** announced it has been granted its first patent for the *Mycobacterium chelonae* strain to prevent and/or control tuberculosis.

**Natac** published a study on the effects of AQUOLIVE, a patented olive extract, on innate immune response in Atlantic salmon based on kidney analysis. The company also announced it is setting up a new manufacturing plant in Hervás, Extremadura, where it will be able to expand several product lines.

## INDUSTRIAL

The **ClaMber** R&D biorefinery in Puertollano, which belongs to the Regional Institute of Agricultural and Forestry Research and Development of Castille-La Mancha (IRIAF), through the URBIOFIN European project, announced it is producing bioplastics on a demonstration scale for the agricultural and cosmetics sectors using solid organic waste from towns.

# 6.4 Product launches

**There was a 20% increase in products and services launched to market, many related to Covid-19.**

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.

## Licensing and distributions deals.

**AlgaEnergy** signed a product licensing and distribution deal with Canadian firm Laboratoire M2.

**Almirall** and **Kaken Pharmaceutical** signed a licensing and distribution deal for the European rights to the topical formulation of efinaconazole. Almirall also signed a licensing deal with Ichnos Sciences for a first-in-class IL-1RAP antagonist monoclonal antibody.

**Ferrer** signed a licensing deal with Treeway for development and commercialisation of an oral formulation of edaravone (TW001 / FNP122i) for amyotrophic lateral sclerosis (ALS) in some territories, including Europe and some countries in Asia.

**Grifols** began commercialisation of TAVLESSE® in France, Italy and Spain to treat chronic immune thrombocytopenia. And with OrphanPacific, they also announced commercialisation will begin in Japan for Lynspad™, an alpha-1 protease inhibitor to treat severe alpha-1 antitrypsin deficiency (AATD).

**Integra Therapeutics** acquired an exclusive licence to develop and exploit the patents related to the synthetic nucleases generated by CIC nano-GUNE and another licence for the patents related to the UniLarge technology (FiCAT) from Pompeu Fabra University.

**Oncoheroes** granted a worldwide licence for the exclusive rights to develop and commercialise volasertib for cancer in adults to Notable Labs, Inc.

**PharmaMar** announced a licensing deal with Lotus Pharmaceutical to commercialise the cancer drug Zepzelca® (lurbinectedin) in Taiwan, and with Eczacibasi for Turkey and Adium Pharma in Latin America.



## Products or 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 2021, AseBio members launched 127 new products and services to market. This is nearly 20% more than the previous year, when there were 106.

**Like in 2020, companies continued to launch solutions to fight SARS-CoV-2 in 2021. There were 19 products in total to diagnose or detect this disease.**

| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Agarose Bead Technologies | Protein G Agarose Resin | Purification of antibodies for diagnostic testing. |
| Agarose Bead Technologies | Magnetic Beads | Magnetic agarose beads to purify, separate or immobilise biomolecules. |
| Agarose Bead Technologies | Dextrin Agarose Resin | Purification of recombinant proteins with an MBP tag (maltose-binding protein). |
| Ainia | Viability PCR | Viability PCR for Salmonella. |
| Algenex | Fribroblast growth factor 2 (FGF2) human and bovine | Recombinant protein, purified and lyophilised, for use in cell culture media for pharmaceutical bioprocesses or production of cultured meat. |
| Algenex | Epidermal growth factor (EGF) human and bovine | Lyophilised recombinant protein for use in cell culture media for pharmaceutical bioprocesses or production of cultured meat. |
| Algenex | Platelet derived growth factor (PDGF) human and bovine | Recombinant protein, purified and lyophilised, for use in cell culture media for pharmaceutical bioprocesses or production of cultured meat. |

Table 6.3. Products and services launched to market by AseBio members in 2021. Source: AseBio.

| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Algenex | RNA primase | Recombinant protein, purified and frozen, for use in industrial nucleic-acid production processes. |
| Algenex | Protelomerase | Recombinant protein, purified and frozen, for use in industrial nucleic-acid production processes. |
| Algenex | DNA polymerase | Recombinant protein, purified and frozen, for use in industrial nucleic-acid production processes. |
| Algenex | Herdscreen® ASFV | Rapid test to detect antibodies to African swine fever. |
| Almirall | Klisyri® (tirbanibulin) | Topical microtubule inhibitor to treat actinic keratosis (AK) on the face and scalp in adults. |
| Ams Lab | Casein identification service | Identification of casein A1/A2 in dairy products. |
| Biocross | e4Quant | Determination of blood Apolipoprotein E4 levels. |
| Biohope | Immunobiogram | Personalisation of immunosuppressive treatment in patients who have had a liver transplant (IVD). |
| Bioibérica | Condrovet puppies | Dietary supplement to provide nourishment for growing joints in puppies, particularly for large breeds that grow quickly and those predisposed to hip dysplasia. |
| Bioibérica | Pro-enteric Advanced | Probiotic recommended for symptomatic treatment of diarrhoea. |



| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Bioinicia in collaboration with CSIC | PROVEIL® | Masks with a new filter medium developed by the Spanish National Research Council (CSIC) and Bioinicia. |
| Biolan Health | OSAXYL 7000 | Diagnosis of lactose intolerance. |
| Biolan Health | COVID-19 IgG/IgM Rapid Test Cassette | Covid-19/SARS-CoV-2 rapid antibody test. |
| Biolan Health | COVID-19 Antigen Rapid Test | Covid-19/SARS-CoV-2 rapid antigen test. |
| Biolan Health | OSASENglobal | Exclusive digital platform to monitor diagnostic data. |
| Biolan Microbiosensores | BIOFISH 3000 HIS | Measurement device, enzymatic biosensor, specific and connected to quantify histamine levels in fish. |
| Biolan Microbiosensores | BIOFISH 3000 SUL | Measurement device, enzymatic biosensor, specific and connected to quantify sulphite levels in crustaceans. |
| Biolan Microbiosensores | BIOMILK 3000 | Measurement device, enzymatic biosensor, specific and connected to quantify lactose levels in low-lactose and lactose-free products. |
| Biolan Microbiosensores | BIOFOOD 3000 | Measurement device, enzymatic biosensor, specific and connected to quantify sulphite levels in dried fruit. |
| Biolan Microbiosensores | BIOFISH 7000 HIS | Portable, pocket-sized biosensor device, connected to quantify histamine levels in fish. |

| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Biolan Microbiosensores | BIOFISH 7000 SUL | Portable, pocket-sized biosensor device, connected to quantify sulphite levels in culture water. |
| Biolan Microbiosensores | BIOMILK 7000 | Portable, pocket-sized biosensor device, connected to quantify lactose levels in lactose-free dairy products. |
| Biolan Microbiosensores | BIOLANglobal | Digital platform for comprehensive smart monitoring of food quality and analysis management processes. |
| Biomar Microbial Technologies | Production plant | Fermentation production plant for scale-up and method-development projects up to 3,000 litres. |
| Biosearch | Hereditum Lc40® gotas | Probiotic designed specially to boost the immune system, patented and backed by clinical trials, for mothers looking to strengthen their children's immune system. |
| Biosearch | Maslive | Aqueous olive extract with high concentration of triterpenes like maslinic acid, which has cardioprotective effects and improves the symptoms of metabolic syndrome, with antioxidant and anti-inflammatory effects. |
| Biotechvana | LIMS | Lab-management software. |
| Biotechvana | GPRO suite | Bioinformatics infrastructure to analyse NGS data. |
| BTI Biotechnology Institute | Oral DX (App) | Diagnostic and treatment tool that provides clinical and visual information on various pathologies in oral medicine. |



| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| BTI Biotechnology Institute | BTI Scan 4 | Planning software for implant surgery and prosthesis design. |
| Cellus Biomedica | KURA HOME | Covid-19 PCR self-test (SALIVA). |
| Diversa Technologies | DIVTECH kits | Intracellular administration of small drugs, peptides and proteins. |
| Enzymlogic | COVALfinder® | Detailed characterisation of several therapeutic targets, the binding mechanism of reversible and irreversible drugs, the inactivation parameters of irreversible compounds: kinact, kinact/KI) and affinity (KI). |
| Flomics Biotech | Stratus | Automated analysis platform for sequencing data from Covid-19 patients. |
| Flomics Biotech | Genomics | Personalised services in the field of genomics and mass DNA and RNA sequencing. |
| Foundation for Biomedical Research of Ramón y Cajal University Hospital | Panel of biomarkers for multiple sclerosis and oncohaematology | Ultra-sensitive biomarker detection: interleukins and miRNAs. |
| Foundation for Biomedical Research of Ramón y Cajal University Hospital | AI for interpretation of kidney ultrasound | Helps interpret images from adult kidney ultrasounds using AI. |

| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Foundation for Biomedical Research of Ramón y Cajal University Hospital | Aptamers for Covid-19. | Development of therapeutic aptamers to target the SARS-CoV-2 protein spike and various viral peptides highly conserved in regions involved in virus access. |
| Foundation for Biomedical Research of Ramón y Cajal University Hospital | MS biomarkers | Biomarkers to identify MS patients who will respond well to Tecfidera. |
| Foundation for Biomedical Research of Ramón y Cajal University Hospital | MS biomarkers | Biomarkers to predict autoimmunity in MS patients treated with alemtuzumab. |
| Foundation for Biomedical Research of Ramón y Cajal University Hospital | ARF biomarkers | Diagnostic and/or prognostic method to determine acute kidney damage using miRNAs. |
| Foundation for Biomedical Research of Ramón y Cajal University Hospital | AI to help diagnose osteoporosis | Helps interpret images from conventional hip and femur x-rays using AI. |
| Genómica | CLART® Fast PneumoVir | Qualitative in vitro diagnostic kit to detect the 21 types and subtypes of viruses that cause respiratory infections in humans. |
| Grifols | TAVLESSE in Spain, France and Italy | Treatment for immune thrombocytopenia in adults. |



| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Grifols | Xembify® 20% in EU | Treatment of human immunodeficiencies. |
| Grifols | HyperHEP B® in US | New formulation of human hepatitis-B immune globulin (HBIg) for prophylaxis post-exposure to the hepatitis-B virus. |
| Grifols | Albutein FlexBag™ (Albumin in flexible packaging) in US | Albutein FlexBag™ 5% and 20% and launch of Albutein FlexBag™ 25% to facilitate use and durability. |
| Grifols | Lynspad™ in Japan | Treatment for alpha-1 antitrypsin deficiency. |
| Grifols | Procleix Babesia and Ultrio Plex E | Test to simultaneously detect HIV, hepatitis B, C and E, and Babesia parasite. |
| Grifols | Gri-fill 4.0 | Semi-automatic device to prepare sterile intravenous compounds. |
| GSK | Xevudy (sotrovimab) | Monoclonal antibody to treat adults and adolescents with Covid-19 who don't require supplemental oxygen and who have a greater risk of progressing to serious Covid-19. |
| Histocell | Reoxcare Gel | Active hydrogel that acts as a line of defence against free radicals in the environment of damaged skin and wounds. |
| Ibima | Cuidaven | Application to care for venous devices. |
| Immunostep in collaboration with CSIC | Anti-SARS-CoV-2 Test Multi-antigen for -IgG+IgA+IgM | Covid-19 antibody test. |

| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Ingenasa | Ingezim ASFV-R | Indirect ELISA to detect African swine fever antibodies in serum samples from pigs. |
| Ingenasa | Ingezim BVD 2.0 | Double antibody ELISA to detect BVDV (Erns protein) in bovine blood and tissue samples. |
| Ingenasa | Ingezim COVID-19 Vet | Indirect ELISA to detect specific antibodies to detect SARS-CoV-2 in animal species. |
| Ingenasa | Ingene BVDV | Real-time PCR to detect BVDV virus (all serotypes). |
| Ingenasa | Ingene PRRSV | Real-time PCR to detect PRRSV virus (all isolates). |
| IRB Barcelona | Drug Screening Platform | Drug screening platform service. |
| IUL | iPeak+ | The iPeak®+ device is designed for in vitro diagnostics to detect, semi-quantify and/or quantify lateral flow tests. |
| LabGenetics | Clinical exome expanded to 6,610 genes | Clinical exome analysis with DNA prep with enrichment kit on the Illumina NextSeq 1000 sequencer. |
| Miaker Developments | PLATFLY | Single platform for in vivo screening of compounds to treat neurodegenerative and neuromuscular diseases. |
| Miaker Developments | MIAKER CRO CLÍNICA | Clinical trials, from drugs in various phases to clinical devices. Designing the study and monitoring procedures. |



| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| MSD España | PREVYMIS 240 mg film-coated tablets PREVYMIS 480 mg film-coated tablets | PREVYMIS (active ingredient letermovir) is indicated for prophylaxis of cytomegalovirus (CMV) reactivation and disease in adult CMV-seropositive recipients [R+] of an allogeneic haematopoietic stem cell transplant (HSCT). |
| Natac Biotech | Organic olive-leaf extract | 6%-40% Oleuropein to boost cardiovascular health and the immune system. |
| Natac Biotech | Organic saffron extract | 1%-3 % Safranal and 2%-8% Crocin to boost emotional and eye health. |
| Naturemimetix (Celavista) | Itxasol® 30 CAP | Epimimetic product for urinary-tract health, supports normal bladder function and helps boost the body's natural defences against external agents. |
| Naturemimetix (Celavista) | Itxasol® 6 CAP | Epimimetic product for urinary-tract health, supports normal bladder function and helps boost the body's natural defences against external agents. |
| Naturemimetix (Celavista) | Teupotheina® | Epimimetic product that contributes to normal prostate and urinary-tract function. |
| Netsteril | VH2O2 biodecontamination services | Services to disinfect areas for sterile operations. |
| Netsteril | Voice-controlled eBR systems (process digitalisation) | Voice-guided logging systems for advanced therapy processes or similar. |
| Netsteril | Smart isolators | Barrier or protection systems for bioprocesses. |
| Nostrum Biodiscovery | PELEplatform 1.6 | Suite of algorithms to find novel solutions to drug discovery problems. Fragment libraries for FragPELE, Open Force Field integration and covalent docking tool. |

| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Novartis Farmacéutica | Luxturna | Indicated for treatment of adults and children with vision loss caused by inherited retinal dystrophy due to confirmed mutations in both copies of the RPE65 gene who have sufficient remaining viable retina cells. |
| Nucaps | Microencapsulated probiotics | Product to add to functional foods. |
| Nucaps | Encapsulated ingredients for animal feed | Product for functional feed. |
| Operon | Real SARS-CoV-2 | Test for qualitative detection of the SARS-CoV-2 coronavirus, which causes Covid-19 infection, using real-time PCR by amplifying and detecting a region of the E gene and the orf1ab gene in human nasopharyngeal and oropharyngeal, nasal, oral and saliva samples. |
| Operon | Dry positive control Ag SARS-CoV-2 | Control to check the Simple/Stick Ag SARS-CoV-2 test is working properly. |
| Operon | OPERON Rapid Test Reader | Device that reads and interprets Simple Ag SARS-CoV-2 quickly, objectively and traceably, as well as offering the option to handle information through secure export of data to a management system or data-storage service platform. |
| Progenika Biopharma | Promonitor Quick (IFX). | Rapid point of care lateral flow test (LFT) based on a sandwich immunoassay to quantify infliximab (IFX). |
| Progenika Biopharma | Promonitor TCZ | Enzyme-linked immunosorbent assay for quantitative detection of tocilizumab in human serum. |



| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Progenika Biopharma | Promonitor ANTI-TCZ | Enzyme-linked immunosorbent assay (ELISA) for quantitative detection of anti-tocilizumab antibodies in human serum. |
| Promega Biotech Ibérica | ICOS & CD28 Bioassays | Assay based on bioluminescent cells that measures the power and stability of antibodies and other biological products that activate ICOS. |
| Promega Biotech Ibérica | Lumit™ IL-1β (Human and Mouse) Immunoassay Kits | Immunoassay based on binary NanoLuc® technology (NanoBiT® technology) for biomolecular interaction studies. |
| Promega Biotech Ibérica | Membrane TNFα, VEGF, RANKL Target Cells | Genetically engineered cell line stably expressing a cleavage-resistant form of mTNF, mVEGF or mRANKL that enforces surface expression. |
| Promega Biotech Ibérica | RealTime-Glo™ Extracellular ATP Assay | Bioluminescent assay designed for kinetic monitoring of ATP released from dying, stressed or activated cells. |
| Promega Biotech Ibérica | T Cell Activation Bioassay (TCRαβ-KO) | Bioassay that activates T cells (TCR-KO) to conduct functional transgenic TCR tests for classification of antigens, specificity studies and safety tests. |
| Promega Biotech Ibérica | HaloPROTAC3 and ent-HaloPROTAC3 | Assay that uses the PROTAC fusion tag to break down specific targets. |
| Promega Biotech Ibérica | NanoLuc® Labeling System | Assay to chemically label antibodies with NanoLuc® for direct, competition and indirect immunoassays. |
| Promega Biotech Ibérica | GoTaq® Enviro Wastewater | Assay to quantify SARS-CoV-2 in wastewater. |
| Promega Biotech Ibérica | LMR MSI Analysis System | Analysis system based on PCR to detect microsatellite instability. |

| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Promega Biotech Ibérica | ProDye™ Terminator Sequencing System | Improved method of fluorescent Sanger sequencing using patented new thermostable DNA polymerase. |
| Promega Biotech Ibérica | Maxwell® CSC 48 Instrument | Automatic nucleic-acid extractor for 48 samples with IVD marking. |
| Promega Biotech Ibérica | GoTaq® Enviro Wastewater | Assay to quantify SARS-CoV-2 in wastewater. |
| Proteos Biotech | PBSerum HA 2.0 HIGH | Slightly cross-linked low molecular weight hyaluronic acid. Inhibits multiplication of fibroblasts and activation of factors involved in fibrotic processes. |
| Proteos Biotech | PBSerum HA 2.0 MEDIUM | Slightly cross-linked low molecular weight hyaluronic acid. Inhibits multiplication of fibroblasts and activation of factors involved in fibrotic processes. |
| Proteos Biotech | PBSerum HA 2.0 LOW | Slightly cross-linked low molecular weight hyaluronic acid. Inhibits multiplication of fibroblasts and activation of factors involved in fibrotic processes. |
| ProtoQSAR | ProtoICH | Online software for toxicology assessment of mutagenicity in drug impurities and compliance with ICH regulations. |
| ProtoQSAR | ProtoPRED | Online software to predict the toxicological effects of chemical substances on human beings and the environment. |
| ProtoQSAR | ProtoREACH | Online software to assess the physical, chemical, toxicological and eco-toxicological properties of compounds, particularly for compliance with REACH regulations. |

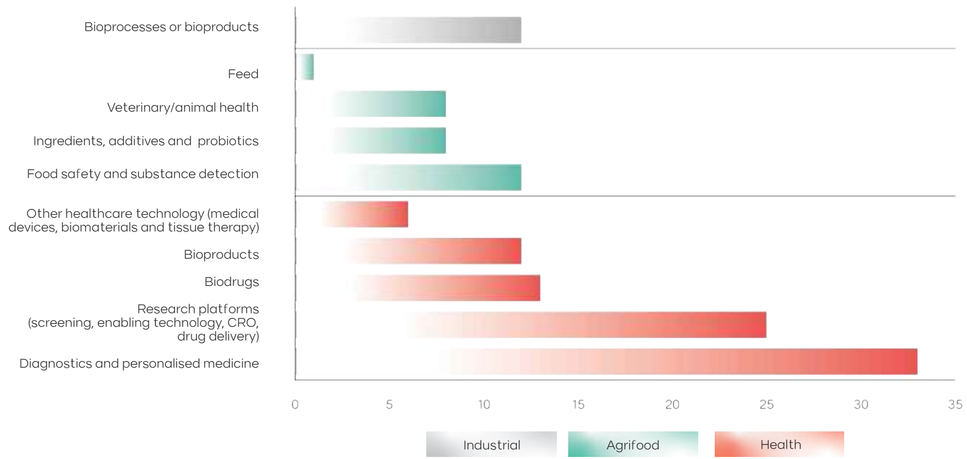


| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Sanofi | EHR2EDC | Methodology to combine electronic health records (EHR) from hospitals and electronic data capture systems (EDC) used in clinical trials so real-world data can be reused in regulatory clinical trials. |
| Sanofi | Efluelda suspension for injection in pre-filled syringe (New indication) | For active immunisation in adults 60 and over to prevent influenza. |
| Sanofi | Toujeo 300 unit/ml DoubleStar, injectable solution in pre-filled pen | Treatment of diabetes mellitus in adults, adolescents and children 6 and over. |
| Sanofi | Praluent 300 mg injectable solution in pre-filled pen | Indicated in adult patients with primary hypercholesterolemia (HeFH and non-familial) or mixed dyslipidemia as an adjunct to diet and to treat established atherosclerotic cardiovascular disease to reduce cardiovascular risk, decreasing LDL-C levels. |
| Sistemas Genómicos | Ascires® SGKIT COVID-19 MPX 1-Step Ngene PCR FAST | Rapid test to detect SARS-CoV-2 genetic material using RT-PCR. Frozen and freeze-dried format available in slide or tube with 96 reactions. |
| Sistemas Genómicos | Ascires® SGKIT COVID-19 MPX 1-Step Ngene PCR FAST | Rapid test to detect SARS-CoV-2 genetic material using RT-PCR. Frozen format available in slide or tube with 96 reactions. |
| Sistemas Genómicos | Ascires® SGKIT COVID-19 Variant Multiplex PCR | Test to detect certain characteristic variant mutations of the SARS-CoV-2 virus using RT-PCR in order to classify samples by variant. Frozen and freeze-dried format available in slide or tube with 96 reactions. |

| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Sobi | Doptelet | Doptelet is indicated for treatment of serious thrombocytopenia in adult patients with chronic liver disease who are scheduled to have invasive surgery. |
| Sobi | Kineret | Indicated in adults, adolescents, children and nursing infants from 8 months old to treat Still disease, including systemic juvenile idiopathic arthritis (SJIA) and adult-onset Still's disease (AOSD), or in patients with continued disease activity after treatment with non-steroidal anti-inflammatory drugs (NSAIDs) or glucocorticoids and to treat familial Mediterranean fever (FMF). |
| Tecbiocel | Regenia TRAUMA | Plasma rich in growth factors. |
| Tecbiocel | Regenia FEET | Plasma rich in growth factors. |
| Tecbiocel | Regenia CAPILAR | Plasma rich in growth factors. |
| Tecbiocel | Regenia AESTHETICS | Plasma rich in growth factors. |
| Tecbiocel | Regenia ULCERS | Plasma rich in growth factors. |
| Tecbiocel | Regenia OPHTALMICS | Plasma rich in growth factors. |
| ZeClinics | Non-Alcoholic Fatty Liver Disease (NAFLD) Model | Service to analyse compounds capable of resolving liver diseases such as NASH. |
| ZeClinics | Metabolic Disorders and Obesity Model | Service to analyse compounds capable of resolving metabolic diseases such as obesity. |
| ZeClinics | Diet Studies | Service to study the effects of different diets on metabolism. |



| Organisation | Name of product/service | Indication of product/service |
|---|---|---|
| Zymvol Biomodeling | Alcohol dehydrogenases | Product for use in industrial biocatalysis. |




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

# One Health: share world, shared health

Belén Barreiro, CEO of Eurofins Ingenasa

One Health is an approach to ensure the health and wellbeing of people, animals and the environment through collaborative problem-solving on the local, national and global levels. The first two things we think of when we talk about One Health are pathogens jumping from one species to another and the issues related to microbial resistance to antibiotics. But it's more than just that. Other concepts to keep in mind include geographic redistribution of infectious diseases, caused by human mobility or redistribution of insects and other animal species as a result of climate change, and the escalation of animal exploitation, and the accumulation of contaminants in soils, water or raw materials, etc. Health problems today are often complex, cross-border, multi-factor and affect more than one species of plants and animals. If tackled from a purely medical, veterinary or ecological standpoint, we're unlikely to come up with sustainable mitigation strategies.

At Ingenasa we have held and defended this idea since the company was founded. Our R&D department has always sought to acquire the highest level of biotechnology skills, regardless of the desired area of application, whether clinical, food safety, ecological issues or animal health.

Biotechnology offers solutions to most of the challenges under the One Health initiative. Common biotechnology solutions are used for all these applications, both for prevention, such as diagnostics or vaccines, and therapy. But once products are created based on them (again, with identical technological foundation), the regulatory and market-access requirements are completely different.

It is clear that interdisciplinary collaboration is at the heart of the One Health concept, but awareness is very different in the various communities involved. While veterinary and environmental groups have adopted this concept from the very beginning, the medical community has taken longer to get on board and the regulatory community, while it has incorporated it into its discourse, doesn't seem to have kicked off any initiatives in this area yet. AseBio is made up of companies, research centres, universities and service providers that apply science and biotechnology in all areas of Health, with a capital H. We're the maximum supporter and best example of this initiative.

# COLLABORATION AND INTERNATIONALISATION

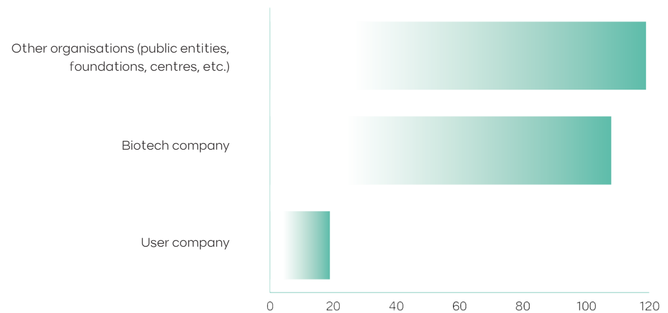
07

# 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.

**R&D is the main goal of collaboration by biotech companies.**

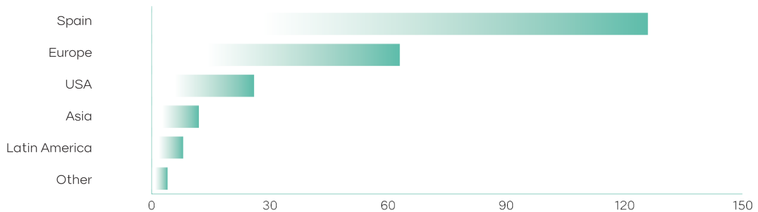
In 2021, biotech firms reached 220 deals or collaborations with other entities, down 11% from 2020. Public-private partnership stands out, with 119 agreements with public research centres or foundations, followed by collaborations with another biotech firm (graph 7.1).




Graph 7.1
Breakdown of alliances in the Spanish biotechnology sector in 2021 by partner profile.
Source: AseBio.

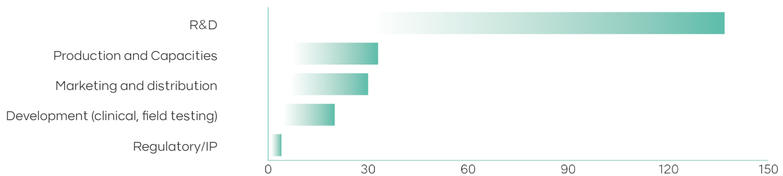


In terms of country of origin of the entities they reach collaboration agreements with (graph 7.2), 51% are international. Of these, 26 collaborations were with the United States, 12 with Asian countries and 8 with countries in Latin America.




Graph 7.2
Breakdown of alliances in the Spanish biotechnology sector in 2021 by partner origin.
Source: AseBio.

Regarding the purpose of the collaboration (graph 7.3), 62% focus on research and development, followed by production or collaboration to boost capacity, and a similar number on distribution or marketing.




Graph 7.3
Breakdown of alliances in the Spanish biotechnology sector in 2021 by purpose of the alliance.
Source: AseBio.

## Research agreements

**3P Biopharmaceuticals** and Osivax joined forces to develop a new universal vaccine for current and future SARS- CoV-2 variants, using the Osivax oligoDOM® technology, designed to induce T-cell response, which would be the basis of a wide-spectrum Covid-19 vaccine.

**Algenex** over the course of the year, reached several collaboration agreements, the most noteworthy being with Sanofi to develop improved baculovirus vectors for SARS-CoV-2 and with Laboratorios Calier to develop a recombinant bovine fertility hormone.

**Biofabri** and IAVI joined forces to advance clinical trials to prove the efficacy of the Spanish tuberculosis vaccine MTBVAC.

**Highlight Therapeutics** and Pivotal announced a collaboration to work on a phase IIa trial to study the efficacy and safety of BO-112 in patients with unresectable or metastatic melanoma.

**Histocell** and Cardiva signed a Spanish distribution deal for Reoxcare, an antioxidant treatment with natural ingredients to cure chronic wounds.

**Innoup Farma** and **Biotechnology development for Industry in Pharmaceuticals**, with Certest, Inbiolev and Levprot Biosciences, set up a consortium to develop thermostable mRNA vaccines for the delta variant of SARS-CoV-2.

**Eurofins Ingenasa** announced its participation, alongside companies such as Nestlé and Lumensai Sensors, in the SaPher Project, which aims to industrialise and roll out an allergen testing platform using automatic nano-photonic biosensors.

**MOA Foodtech** reached several collaboration agreements with AB Azucarera, Barilla and Viscofan for upcycling and revalorising byproducts.

**Natac** joined two projects: OLEAF- 4VALUE, to tackle the problems of olive biomass by developing a complete upcycling system for olive leaves, and HEALTH4BRAIN to help personalise diet by designing personalised functional foods and a validated nutrigenetics test.

The **Grupo Peaches** joined Fuenlabrada University Hospital in creating the first bioincubator for companies associated with technological development in the field of cell therapy with the goal of accelerating clinical trials and research projects in advanced cell therapy.

**Oncoheroes** agreed with SHEPHERD Therapeutics to collaborate on discovery, development and commercialisation of innovative pharmaceutical products for rare oncology indications.

**PaloBiofarma** has set up a consortium with Mediobiofarma and Oncostellae for an R&D project with three new therapies for personalised cancer treatment.

**PharmaMar** and Jazz Pharmaceuticals announced the beginning of a phase III clinical trial to confirm lurbinectedin as a treatment for patients with recurring small-cell lung cancer.

**Sylentis, Arthex Biotech, AptaTargets, Aptus Biotech, Nostrum Biodiscovery,** Nanovex Biotechnologies and Biotechnology Development for Industry in Pharmaceuticals kicked off the OLIGOFASTX project, which aims to create a comprehensive platform to facilitate and contribute to accelerating development of therapies based on oligonucleotides to treat rare diseases in Spain.

**Venter Pharma** reached an agreement with **Biolan Health** to work together to design a portable tool to diagnose hypolactasia.

**ZeClinics,** Amsterdam UMC and Taros Chemicals announced their participation in the European consortium CARDIOMYO to accelerate the discovery of drugs for cardiomyopathy.

**Zymvol Biomodeling** and Aminoverse will be working together to develop personalised alcohol dehydrogenases by using data to optimise enzymes.

# SDG 14: Conserve and sustainably use the oceans, sea and marine resources for sustainable development

Global challenges like climate change and soil and ecosystem degradation force us to seek out and drive a more sustainable economic model. This new system must be competitive and make efficient use of resources, applying new production and consumption patterns that respect our planet's limits.

The current national and European plans and strategies, such as the European Green Deal, the European Climate Pact and Spain 2050, have established new social goals and call for a gradual reduction in net emissions of greenhouse gases and protection of the European Union's natural resources.

Blue biotechnology's contribution can help tackle this dual challenge that, with a commitment to a more sustainable path, would make it a source of actions and ideas to generate innovation, fuel a quick and lasting recovery, and protect our planet.

Blue biotechnology is the application of science and technology to aquatic life to generate knowledge, goods and services. Algae (macro and micro), bacteria, fungi and invertebrates are among the most important marine resources used as a raw material.

Estimates say we are unfamiliar with over 90% of the organisms that live in our oceans, but each year hundreds of new marine compounds are discovered with promising functions for health and the planet.

These collections that are completed little by little show the innovative nature of a sector that is continuously researching new technology to boost the quality and reliability of these compounds. Climate change is causing the heating of the oceans and seas, acidification of the marine environment and changes in rain patterns. The Spain 2050 Strategy points to advances in biotechnology as a key tool for tackling these challenges and extreme situations.

The biotechnology industry makes it possible to preserve marine ecosystems using techniques to monitor and restore marine habitats, clean polluted waters, break down plastics, improve aquaculture, heal the reefs and sink $CO_2$, among others.



## The European Climate Pact

As part of the Green Deal, the European Climate Pact is an initiative that invites individuals, communities and organisations to take part in fighting climate change, in the ecological transition and in building a greener Europe.

To help roll out the activities in the Pact in all member states, each network of national coordinators connects with people interested in fighting climate change in their country. These groups know the regional and local values, situations, cultural connotations that could have an impact, and have experience with dissemination activities and community management and participation.

Exactly one year ago, AseBio became the Spanish coordinator of the Climate Pact in order to raise awareness and encourage the participation, commitment and initiatives of the ambassadors, citizens and other interested parties. Plus, we help implement strategies to facilitate exchange, cooperation and learning of all those involved.

We will continue working to reach more people and promote this model of resilient, sustainable growth, in which biotechnology

Sofía Garro, Head of National Coordination of the Climate Pact

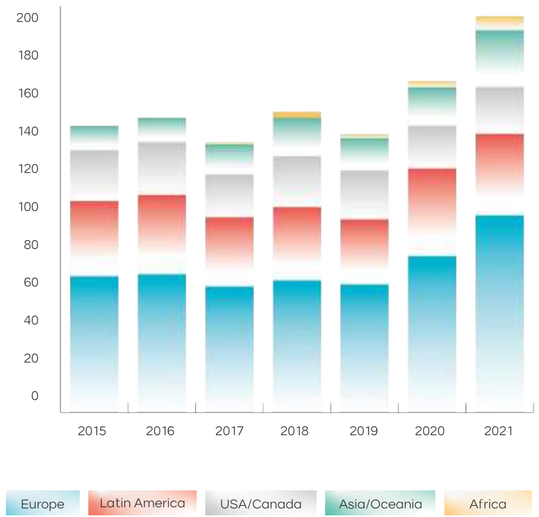
# 7.2 Attracting international companies

**AseBio member companies increase international presence 20% in 2021.**

39 AseBio members (4 more than the previous year) have a direct presence in 51 countries on all continents.

The total number of subsidiaries of our members outside of Spain in 2021 was 195, 32 more than in 2020.

If we look at where members decide to set up subsidiaries by geographic zone, the most popular region is Europe (50%), followed by Latin America (21%), although down from the previous year; and then countries in Asia (14%), which surpassed the United States and Canada (12%) for the first time; and last, although growing in recent years, Africa (4%).




Graph 7.4. Evolution of presence of AseBio member companies by geographic zones (2015-2021). Source: AseBio.



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 | Number of subsidiaries |
|---|---|
| US | 21 |
| France | 12 |
| Germany | 11 |
| Portugal | 11 |
| Italy | 10 |
| Mexico | 9 |
| Brazil | 8 |
| United Kingdom | 8 |
| Belgium | 7 |
| Chile | 7 |
| Switzerland | 7 |
| China | 6 |
| Poland | 6 |
| Colombia | 5 |
| Argentina | 4 |
| Austria | 4 |
| Singapore | 4 |
| Sweden | 4 |

| Country | Number of subsidiaries |
|---|---|
| India | 3 |
| Peru | 3 |
| Czech Republic | 3 |
| Thailand | 3 |
| Turkey | 3 |
| Australia | 2 |
| Canada | 2 |
| South Korea | 2 |
| Netherlands | 2 |
| Japan | 2 |
| Malaysia | 2 |
| Morocco | 2 |
| South Africa | 2 |
| Saudi Arabia | 1 |
| Algeria | 1 |
| Bolivia | 1 |
| Costa Rica | 1 |
| Denmark | 1 |

| Country | Number of subsidiaries |
|---|---|
| Ecuador | 1 |
| Egypt | 1 |
| Philippines | 1 |
| Finland | 1 |
| Greece | 1 |
| Hungary | 1 |
| Indonesia | 1 |
| Ireland | 1 |
| Israel | 1 |
| Monaco | 1 |
| Panama | 1 |
| Romania | 1 |
| Russia | 1 |
| Taiwan | 1 |
| Vietnam | 1 |

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 |
|---|---|
| Ackermann International | Germany, Argentina, Belgium, Brazil, Canada, Chile, China, Colombia, Denmark, US, France, Greece, Netherlands, Hungary, Israel, Italy, Mexico, Panama, Peru, Poland, United Kingdom, Czech Republic, Singapore, South Africa, Switzerland, Turkey |
| Agarose Beads Technologies | US |
| Agrocode | Brazil, China, US, Peru |
| AlgaEnergy | Australia, Brazil, US, France, India, Italy, Japan, Mexico, Turkey |
| Almirall | Germany, Austria, US, France, Netherlands, Italy, Poland, United Kingdom, Switzerland |
| AMS Lab | Italy, Morocco, Portugal |
| Antares Consulting | Belgium, Bolivia, France, Portugal |
| Arquimea | Germany, US, Malaysia |
| Asphalion | Germany, United Kingdom |
| Atrys Health | Brazil, Chile, Colombia, Portugal, Switzerland |
| BBI bcn | Mexico, United Kingdom |
| Biobide | US |
| Bioibérica | Germany, Brazil, US, Italy, Poland |
| Biolan | Chile, Ecuador, Philippines, France, Indonesia, Morocco, Mexico, Portugal, Thailand |
| BTI Biotechnology Institute | Germany, US, France, Italy, Mexico, Portugal, United Kingdom |
| Elzaburu | China |
| Ferrer | Germany, Austria, Belgium, Chile, Costa Rica, US, Mexico, Peru, Portugal |
| 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 |
| Laminar Pharma | US |
| Leti | Germany, Portugal |
| Life Length | US |
| Mabxcience | Argentina, Switzerland |
| Minoryx Therapeutics | Belgium |
| Natac Biotech | US |
| Neurofix | US |
| Nimgenetics | Brazil, Mexico, Portugal |
| Noray Bio | France, Italy |
| Oncoheroes | US |
| Oryzon | US |
| PharmaMar | Germany, Austria, Belgium, US, France, Italy, Switzerland |
| Proteos Biotech | Colombia |
| PV Pharm | Czech Republic |
| Reig Jofré | Belgium, US, France, Monaco, Poland, Portugal, United Kingdom, Singapore, Sweden |
| Sanifit | US |
| Sermes CRO | Chile |
| Valtria | Algeria, Argentina, Chile, Finland, France, Mexico, Switzerland |
| Venair | Germany, Brazil, China, Colombia, South Korea, US, France, India, Italy, Poland, United Kingdom, Romania, Russia, Singapore, South Africa, Sweden, Thailand, Turkey, Vietnam |
| Vitro | Portugal |

# Preserving biodiversity and improving soil and forest health to ensure sustainably and food supply

The Centre for Plant Biotechnology and Genomics (CBGP) belongs to the Polytechnic University of Madrid and the National Institute for Agricultural and Food Research and Technology (INIA), recently integrated into the Spanish National Research Council (CSIC). The CBGP has been accredited as a Severo Ochoa Centre of Excellence twice, recognising its history in science. The research and scientific/technical staff at the centre work in four areas of research: Plant Development, Interaction of Plants and the Environment, Computational Systems Biology and Genomics, and Synthetic Biology and Bioengineering.

The CBGP, and plant biotechnology and genomics in general, is working on the challenge of generating and developing technology to sustainably feed the population despite climate change and the growing global population. Biotechnology and genomics are and will be necessary to meet the Sustainable Development Goals (SDG), such as SDG 15, and to come up with new solutions that allow us to produce food that doesn't have a negative impact on biodiversity or fuel desertification. These new solutions must mitigate degradation and loss of soil biodiversity and help our forests better adapt to environmental changes.



CBGP CENTRO DE BIOTECNOLOGÍA Y GENÓMICA DE PLANTAS UPM-INIA

EXCELENCIA SEVERO OCHOA 2022 - 2025

SUSTAINABLE DEVELOPMENT GOALS

15 LIFE ON LAND

Our challenge is to reduce the use of raw materials (fertilisers and pesticides) and water in agriculture, care for our land and boost agricultural productivity without increasing farmed surface area.

New tools from genomics and computational biology and biosystems give us an in-depth characterisation of the biological diversity of plants and microorganisms and help identify genetic variants and new functionalities (genes, proteins, metabolites) that can contribute to better crop yield and adaptation and improved agricultural sustainability.

We must delve deeper into genomic characterisation of biodiversity in various environments, including extreme ones, and of the species already preserved in seed banks.

Biological diversity will allow us to generate new varieties of crops and trees that are better adapted and more efficient, using plant breeding technology and new biotechnology tools like gene editing (CRISPR). Biodiversity studies are allowing us to identify microorganisms and new biomolecules that can be commercialised as biostimulants, biofertilisers and biocontrol elements, helping boost agricultural sustainability and preserve biodiversity.

The challenges ahead are complex and to tackle them we need cooperative science programmes like those our centre has launched and that deal with the adaptation of plants and crops to new environmental conditions, improving nutrition and plant development.

Faced with this global challenge, we must enter into and consolidate collaborations with institutes that are global benchmarks in scientific research.

To tackle the challenges of SDG 15, we must accelerate transfer of the knowledge generated and new technology developed to the productive sector and to society, and to do so we need decisive public-private innovation initiatives. Our mission: to make biodiversity and genetic resources a legacy for the coming generations.

Our commitment: to help address the challenges posed in the SDGs, European Green Deal, Farm to Fork Strategy and EU Missions. And always with our sights set on the future.

Antonio Molina,
Director

# IMPACT

# 08

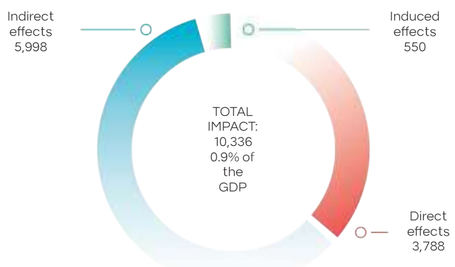
# 8.1 Economic impact

## IMPACT ON GDP

**The contribution of biotech to the GDP rose slightly to 0.9%.**

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 2020, the activities of biotech firms generated more than €10.3 billion in income, roughly 0.9% of the Spanish GDP, mainly through indirect effects caused by flows of intermediary goods and services (graph 8.1).




Graph 8.1. Impact of biotech companies on the GDP (€ millions of 2020 GDP). Source: Compiled internally from a sample of companies collected by AseBio.



## CONTRIBUTION TO THE WELFARE STATE

**Biotech firms contribute 0.4% of the GDP in State taxes.**

In 2020, the total impact on tax revenue of biotechnology companies was €4.04 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 8.2).

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 8.2. Impact of total tax revenue from biotech companies (€ millions of 2020 tax revenue). Source: Compiled internally from a sample of companies collected by AseBio.

## TOTAL PRODUCTION OF BIOTECH FIRMS

**The joint turnover for biotech companies was 1.1% of the GDP in 2020.**

In 2020, biotech firms saw a slight rise in turnover, up 1.5%. This pushed the joint total to over €12 billion and 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 €3.8 billion in income. Of this income, €1.99 billion went to employee compensation and €1.8 billion was gross operating surplus and net taxes. Additionally, total employment by biotech companies was up 6%, to over 31,000 jobs, making up 0.16% of total employment (table 8.1).

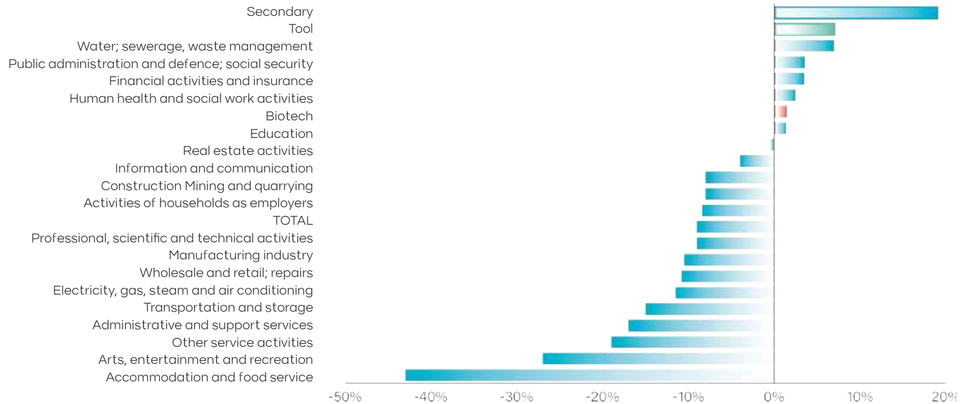
Table 8.1. Estimated economic activity of biotech firms. Source: Compiled internally from a sample of companies collected by AseBio.

| | | 2020 | 2019 | 2018 | 2017 | 2016 | 2015 | 2014 | 2013 | 2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| Production | € millions | 12,089 | 11,914 | 9,861 | 9,315 | 8,787 | 8,777 | 7,664 | 6,368 | 7,045 |
| | % gwth | 1.5% | 20.8% | 5.9% | 6.0% | 0.1% | 14.5% | 20.4% | -9.6% | 0.1% |
| | % GDP | 1.1% | 1.0% | 0.8% | 0.8% | 0.8% | 0.8% | 0.7% | 0.6% | 0.7% |
| Intermediate goods | € millions | 8,301 | 8,174 | 7,230 | 6,433 | 6,592 | 6,907 | 5,952 | 5,040 | 5,523 |
| Gross value added | | 3,788 | 3,740 | 2,631 | 2,882 | 2,195 | 1,870 | 1,712 | 1,328 | 1,522 |
| Employee salaries | | 1,987 | 1,878 | 1,759 | 1,515 | 1,330 | 1,244 | 1,096 | 875 | 947 |
| Sur. Gross margin profit and Net taxes | | 1,801 | 1,862 | 872 | 1,368 | 866 | 626 | 616 | 453 | 575 |
| Employment | Number of people | 31,287 | 29,512 | 27,085 | 25,029 | 22,637 | 21,504 | 19,120 | 15,129 | 16,470 |
| | % gwth | 6.0% | 9.0% | 8.2% | 10.6% | 5.3% | 12.5% | 26.4% | -8.1% | -1.5% |
| | Total % | 0.16% | 0.15% | 0.14% | 0.13% | 0.12% | 0.12% | 0.11% | 0.09% | 0.09% |

**The biotechnology sector is one of the few to see an increase in production growth.**

As graph 8.3 shows, 2020 closed with the biggest downturn in production levels in recent history, with an average drop of 10%, and very few activities remained unaffected. Biotechnology activities, however, were among the select few that avoided this recession and, in fact, were ranked at the top of production growth. Companies with biotechnology as a secondary activity saw production increase 18.8%, companies that use biotechnology as a production tool, 7.2%; and biotech firms, 1.5%.






Graph 8.3. Comparative growth dynamics of biotechnology activities and other economic activities. Source: Compiled internally from a sample of companies collected by AseBio and the INE Survey on Biotechnology Use.

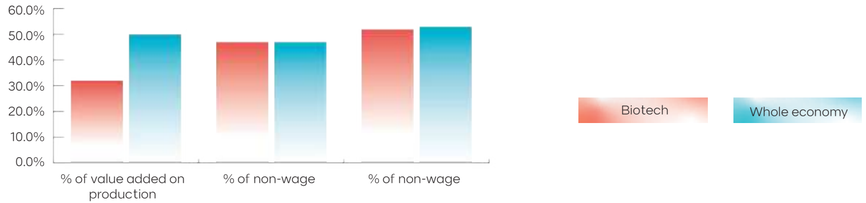
## PRODUCTIVITY AND SALARIES

**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 more than triple the Spanish national average and 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 notably lower than the national average, due to the greater need to acquire intermediary goods and services for use in production (graph 8.4).

Graph 8.4. Basic productivity ratios for biotech firms and the whole economy. Source: Compiled internally from a sample of companies collected by AseBio.




# 8.2 Impact on employment

Graph 8.5. Impact on total employment of biotech firms (Total jobs in 2020). Source: Compiled internally from a sample of companies collected by AseBio and the INE Survey on Biotechnology Use.


**Spanish biotech companies accounted for 120,000 jobs, 0.7% of total employment nationwide, up 3.5%.**

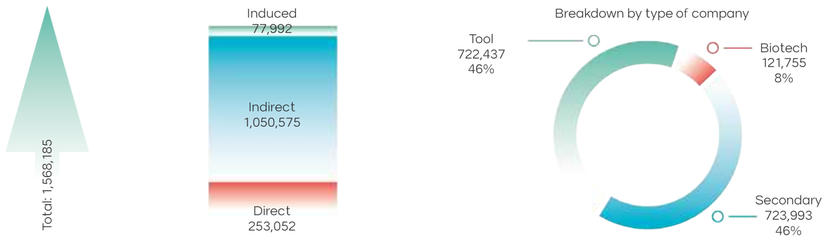
As is the case with income, the impact on employment from activities carried out by biotech firms is amplified throughout the production chain. So, for each direct job created, nearly three indirect or induced jobs are also generated. This means these companies are responsible for maintaining more than 122,000 jobs that make up 0.7% of the national total (graph 8.5).



If we broaden our analysis of the impact on the labour market as a whole to include all companies doing biotechnology activities (biotech, secondary and tool), the total employment that directly or indirectly depends on the activities carried out by these companies is more than 1.5 million jobs, or 9.2% of the national total (graph 8.6).

Breaking these figures down, 76% of these are direct effects from the consumption of intermediary goods and services and investments made by biotechnology companies.

By type of company, biotech firms account for 8% of this impact, while those with biotechnology as a secondary activity and those that use it as a production tool contribute 46% each.

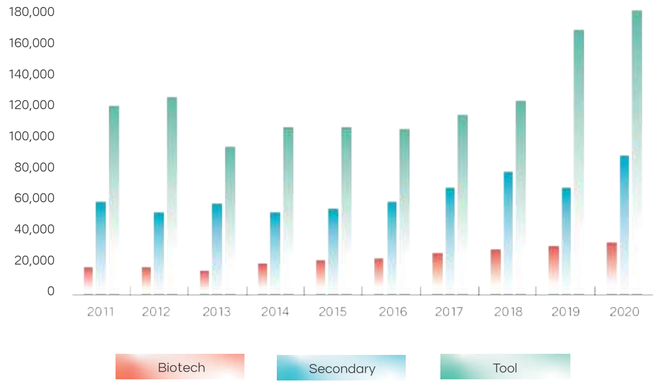



Graph 8.6. Total contribution to employment by companies with biotechnology activity. Source: Compiled internally from a sample of companies collected by AseBio and the INE Survey on Biotechnology Use.

The evolution of total employment tied to companies that carry out biotechnology activities was particularly favourable in 2020, with average growth of 12.7%, meaning over 30,000 new employees. Therefore, the total volume of employment at companies with biotechnology activities in 2020 was more than 285,000 employees (graph 8.7).

Of these 285,000 employees, 11% are employed by biotech firms, 29% by companies with biotechnology as a secondary activity and the remaining 60% by those that use biotechnology as a production tool.

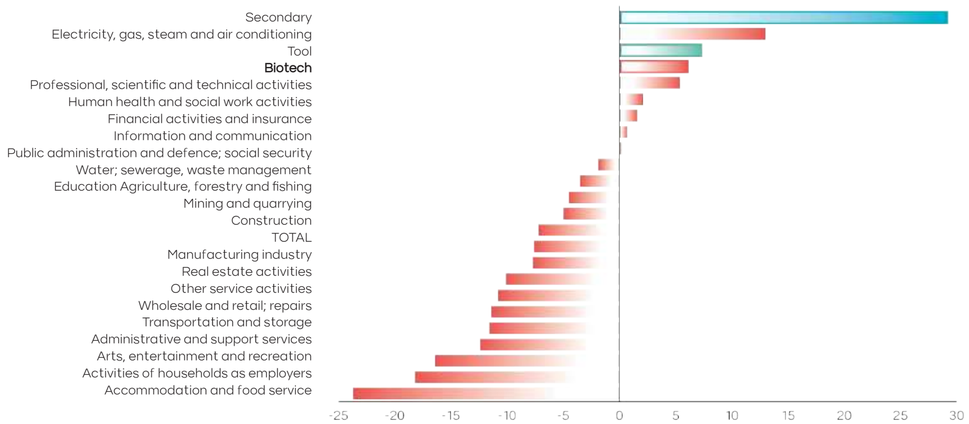
Graph 8.7. Evolution of employment in biotechnology companies. Source: Compiled internally from a sample of companies collected by AseBio and the INE Survey on Biotechnology Use.




Biotechnology activities post excellent employment figures.

As seen in the ranking of production activities with the greatest growth in employment in graph 8.8, companies with biotechnology as a secondary activity were up 29.1%, those that use biotechnology as a production tool up 7.2% and biotech firms, 6%. They are all ranked at the top, along with the energy industry.






Graph 8.8. Comparative employment growth dynamics of companies with biotechnology activity (Employment growth rates 2020). Source: Compiled internally from a sample of companies collected by AseBio and the INE Survey on Biotechnology Use.

## FACILITATING THE WORK OF THE SCIENTIFIC COMMUNITY TO ACCELERATE THE ARRIVAL OF INNOVATIVE THERAPIES

Thirteen generations have passed since a small chemist's was established in 1668 in Darmstadt, Germany. Today that establishment has consolidated its place as a leader in science and technology with a team of over 60,000 people in 66 countries.

A history that spans three centuries and explains why Merck is a company known for its resilience and ongoing commitment to curiosity and innovation. Innovation that has helped it overcome the challenges faced throughout history, but that has also allowed it to keep driving sustainable human progress with one clear goal: to improve people's lives and the planet.

Merck is strongly focused on health, but has a single business model made up of three areas that mean it is present in many fields: healthcare, researching, developing and manufacturing medicines for diseases with unmet medical needs; life sciences, collaborating with the science community, providing the technology and materials needed for research; and electronics, developing specialised materials and equipment that are part of daily life.

Specifically, aware that we can only advance through a firm commitment to science, Merck's life sciences business accompanies the scientific community in its work to make biotechnology research and production safer and more efficient. So, scientists and engineers can resolve issues at each stage of their work using cutting-edge technology, top-notch R&D solutions, and manufacture highly innovative biological products and treatments, such as cell and gene therapies.

The life sciences division has a portfolio of over 300,000 solutions, including for example genome-editing tools to make gene editing easier than ever, with new opportunities to treat serious diseases like cancer or hereditary conditions, as well as applications in fields like green genetic engineering.

It is what we know as CRISPR technology, a tool named by the European Commission as one of the 100 most disruptive technologies and which has been a true revolution in the world of genetic engineering. Today, Merck has 28 CRISPR patents worldwide and is one of the main suppliers of this type of genetic tools

**Big data and artificial intelligence applied to research**

The healthcare and life sciences sector is undergoing a paradigm shift resulting in large part from the use of big data and artificial intelligence (AI). So, incorporating AI and focusing on areas like process mining for advanced data analysis, process optimisation or generating and transferring data will help accelerate scientific discovery, simplify processes and advance individualised medicine.

In this field, Merck offers scientists and researchers the BrightLab™ cloud-based platform to manage inventory and instrument connectivity. This solution connects lab instruments to the cloud through a programming interface that allows scientists to follow up on and update experiments from any computer or mobile device.

The platform also automates workflows and creates a secure, searchable archive of reports, saving researchers hours of unnecessary revision so they can spend their time contributing greater value through research tasks.

The company has also launched the Syntropy project, a collaborative initiative that aims to democratise access to data to improve work on cancer and advance the discovery of new therapies through AI.



Today, oncology patients and research centres all over the world generate a massive amount of biomedical data that isn't integrated, accessible, verifiable or shareable. In fact, often most of this data isn't available to scientists and clinicians. In light of this, the Syntropy technology, which complies with all privacy and security standards, seeks to integrate and unlock this information through a digital platform that allows numerous organisations to share and analyse data. The goal is to give experts leading data-integration and -analysis technology, while ensuring control, ownership and traceability, to advance research and establish more individualised diagnoses for cancer patients.

Collaboration is a key focal point for the company, which is why it reaches collaboration agreements with start-ups such as IKTOS, whose AI technology brings speed and efficiency to the drug discovery process, automatically designing new virtual molecules that have the desired activity to treat a specific disease. Quite the challenge in drug development.

On its path alongside the scientific community, Merck is also committed to talent development and training. In this area, the company works in the academic arena to train future professionals in the latest scientific advances, with three chairs at Spanish universities: the Chair in Individualised Molecular Medicine at the Autonomous University of Madrid, the Chair in Immunology at Francisco de Vitoria University, and the Chair in Biotechnology at CEU San Pablo University.

In the same line, as part of its commitment to transforming the healthcare sector, Merck has recently launched 'Smart Health', the only training programme of its kind in the sector, in collaboration with Tecnun-University of Navarra and IBM. The purpose is to reinforce healthcare professionals' knowledge in AI and big data, two tools that are and will continue to be key in improving healthcare processes.

Furthermore, the company also awards research grants locally and globally to promote projects that can have a real impact on patients' lives. These are the Future Insight Prizes, awarding up to €1 million each year over the next 35 years to encourage innovative solutions to the biggest challenges facing humanity. It is worth noting that the first grant call on sustainability was held in 2021 to encourage research in four key areas: circular economy, digitalisation, new biological pathways and new responsible resources. More than 400 research proposals were submitted from all over the world.

Plus, there is no doubt that the acceleration of scientific discovery and democratisation of innovation are also influenced by the legal and regulatory frameworks under which the scientific community and biotechnology industry carry out their work.

The company, from its place at the helm of AseBio, has been working since 2019 to make these frameworks increasingly favourable to the ecosystem, promoting its activity and helping make it easier for innovations to reach those who need them as quickly as possible.

The future is marked by research, science and talent. And in that future, Merck will continue accompanying patients who live with challenging diseases like cancer or multiple sclerosis, as well as the scientists, researchers and start-ups whose work helps improve the world we live in.

# 8.3 Biotechnology and the 2030 Agenda

**WORKING IN BIOTECHNOLOGY MEANS WORKING TO IMPROVE THE LIVES OF MILLIONS OF PEOPLE AND MAKE THE PLANET MORE SUSTAINABLE.**

## AseBio and the 2030 Agenda.

September 2019 was the fourth anniversary of Spain and 192 other countries signing the 17 Sustainable Development Goals (SGDs) on the 2030 Agenda. Once again this year, the Spanish Bioindustry Association (AseBio) is showing how biotechnology is helping us achieve those goals.

The United Nations estimates the global population will reach nearly 10 billion by 2050, so we will have to have better tools and policies to achieve the SDGs, and biotechnology will undoubtedly be key among them.

Solutions for curing diseases, responding better to health crises, food safety, reducing greenhouse gas emissions and ending hunger will come from the biotechnology sector.

Our sector's innovativeness has given biotechnology a key role in improving quality of life for millions. Now, the 2030 Agenda has set new global challenges for the biotechnology sector, with a universal, comprehensive, transformative vision.



### SDG 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture.

Thanks to biotechnology, we can help end hunger by making crops more efficient and nutritional using techniques like genetic engineering. Plus, by adding probiotics and prebiotics to foods, biotechnology helps make them even healthier. Furthermore, biotechnology techniques can be used to detect toxins and contamination in food, helping ensure food safety.

| | |
|---|---|
| Food safety | ADM Biopolis, AINIA, Best Medical Diet, Biobide, Biolan, Bionos, Ingenasa, Leitat, Operon, Promega Biotech, Protoqsar and Sistemas Genómicos. |
| Improving crops | Agrocode, Alcaliber, Bayer, Bioibérica, Biorizon Biotech, BDI Biotech, Eurogenetics, Genmic, Neiker, Pevesa, Sigma-Aldrich. |
| Improving nutrition | ADM Biopolis, Algaenergy, AINIA, Bayer, BDI Biotech, Best Medical Diet, Bioibérica, Bionat Health, Biosearch Life, Dr Healthcare, DSM Nutritional, Imdea Alimentación, Natac Group, Naturemimetix and Solutex. |
| Improving animal health | ADL Solutions, ADM Biopolis, Algaenergy, Aquilon, Arquimea, Artinvet, Ascil Biopharm, Bioibérica, Bionat Health, Biosearch, Diomune, Histocell, Ingenasa, Ingulados, Leitat, MSD, Microo mics, Neiker, Terbio and VLPbio. |
| New protein sources | MOA Foodtech and Tebrio. |

### SDG 3. Ensure healthy lives and promote wellbeing for all at all ages.

Some 350 million people benefit from biotechnology therapies and 69% of all drugs being developed in the world use biotechnology. Nearly half of all biotech firms focus on human health.

The biotech sector continues to fight diseases like Alzheimer and cancer, producing biodrugs, detecting and diagnosing illnesses more quickly and precisely, producing vaccines and using other biotechnology tools to prevent diseases and contain infectious diseases.

**Developing innovative drugs for diseases like:**

| | |
|---|---|
| Cancer | Abbvie, Ability Pharma, Allinky, Alimirall, Amadix, Amgen, Aptus Biotech, Archivel Farma, Ascil Biopharm, AstraZeneca, Atrys Health, Biomedica, Bristol-Myers, CITRE, Ciber, CRG, ISCIII, CNIO, CRG, DISIT Biotech, Entrechem, Fundación MEDINA, GEICAM, Genetracer, Gilead, GSK, Highlight Therapeutics, Ibima, Incyte, Integra Therapeutics, IIS Fundación Jiménez Díaz, i+12 de Octubre, IGTP, iiS La Fe, iiS Ramón y Cajal, IRB Barcelona, Janssen, Laminar Pharma, Lemtisem Biotech, Leukos Biotech, LiberaBio, Merck, Miltenyi Biotec, MiMARK, MSD, Genetics, Nanoimmunotech, Nanoligent, Naturemimetix, Novartis, OncoHeroes, Onena Medicine, OneChain, Oniria Therapeutics, Immunotherapeutics OWL Metabolomics, Oryzon, Palobiofarma, Peptomyc, Pharmamar, Promega, qGenomics, Roche, SOM Biotech, VCN Biosciences, Vivia Biotech, Vivotecnia, ZeClinics. |
| Rare diseases | Arthex Biotech, Biomarin, CarthaGenetics, Ciber, Fundación MEDINA, Ibima, i+12 de Octubre, ISCIII, Minoryx, Roche, Sanofi, Sobi, SOM Biotech. |
| Central nervous system | Abbvie, Accure Therapeutics, Allinky, Amgen, AptaTargerts, Araclon Biotech, Ascil Biopharm, AstraZeneca, Atrys, Biocross, Biomarin, Bionos, Bristol-Myers, DobeCure, Emerald Biotechnology Spain, Ferrer, Fundación MEDINA, Gate2Brain, Grifols, Grupo Cellus, Ibima, IGTP, iiS Fundación Jiménez Díaz, i+12 de Octubre, iiS La Fe, iiS Ramón y Cajal, IRB Barcelona, Janssen, Laboratorios Rubió, Laminar Pharma, Merck, Miltenyi Biotec, Minoryx, MSD, Naturemimetix, Neural Therapies, Neurofix Pharma, Novartis, Oryzon, Palobiofarma, Roche, SOM Biotech, Sylentis, Vivia Biotech, ZeClinics. |
| Dermatology | Abbvie, Almirall, Bionos, Histocell, Incyte, Inhibitec, Laboratorios Leti, Novartis, Peaches Biotech, Reig Jofre. |



| | |
|---|---|
| Respiratory | Almirall, Amgen, Ciber, Ferrer, Gilead, GSK, Histocell, I, Merck, MSD, Novartis, Palobiofarma, Reig Jofré, Roche, Vivotecnia, Zendal. |
| Cardiovascular diseases | Almirall, Amgen, Aptatargets, AstraZeneca, Bristol-Myers, Ciber, Corify Care, Diomune, Gilead, GSK, Ibima, IGTP, iiS Fundación Jiménez Díaz, i+12 de Octubre, iiS La Fe, iiS Ramón y Cajal, IQS, Janssen, Laboratorios Rubió, Laminar Pharma, Life Length, Miltenyi Biotec, MSD, Natac Group, Novartis, Sanifit, Roche, Sobi, ZeClinics. |
| Immunological diseases | Abbvie, Almirall, AptaTargerts, AstraZeneca, Biohope, Bristol-Myers, GSK, Diomune, Dr Healthcare, Emerald Biotechnology España, Grifols, Ibima, i+12 de Octubre, IGTP, iiS Ramón y Cajal, iiS La Fe iiS Fundación Jiménez Díaz, Incyte, Janssen, Laboratorios Leti, Laminar Pharma, Miltenyi Biotec, Natac Group, Novartis, Palobiofarma, Progenika, Remab Therapeutics, Roche, Sobi. |
| Infectious diseases | Abbvie, ADL, Affirma Biotech, Algenex, Aptus Biotech, Archivel Pharma, Ascil Biopharm, AstraZeneca, Bionos, Bristol-Myers, Ciber, Diomune, Fundación Medina, Gilead, Grifols, GSK, IGTP, iiS Fundación Jiménez Díaz, i+12 de Octubre, iiS La Fe, ISCIII, Janssen, Laboratorios Leti, MSD, Microomics, Promega, Reig Jofre, Roche, SOM Biotech, Vaxdyn, Zendal. |
| Musculoskeletal disorders | Almirall, Allinky, Amgen, Bioibérica, BTI, DobeCure, Grupo Cellus, Histocell, IGTP, Imereti, Incyte, Inhibitec, Laboratorios Rubió, Peaches Biotech, Reig Jofre, Sanifit. |
| Diseases of the digestive system | ADM Biopolis, Almirall, Amgen, Ciber, iiS La Fe, OWL Metabolomics, Mikrobiomik, Palobiofarm, Takeda, ZeClinics. |
| Diseases of the genitourinary system and kidneys | IGTP, iiS Fundación Jiménez Díaz, Laboratorios Rubió, Minoryx, Naturemimetix. |
| Vaccine development | Algenex, Archivel Farma, Ferrer, GSK, Merck, MSD, Vaxdyn, Zendal. |

**Developing products to diagnose diseases:**

| | |
|---|---|
| Developing products to diagnose diseases | ADL Bionatur, ADM Biopolis, Admit Therapeutics, ADNtro, Algenex, Amadix, Aptus Biotech, Araclon Biotech, Arquimea, Atrys, Biocross, Biohope, Biolan, Biomédica, bioSEQs Genomics, Biosfer Teslab, Biotools, BTI, Crazy Science, Diomune, Doitplenoptic, Droplite, Entechem, Ferrer, Flomics Biotech, Genómica, Grifols, Health in Code, iiS La Fe, iiS Fundación Jiménez Díaz, Illumina, Immunostep, Ingenasa, Integromics, IUL, Labgenetics, Laboratorios Rubió, Leukos Biotech, Life Length, Microomics, Nanoimmunotech, Nimgenetics, Operon, OWL Genomics, Progenika Biopharma, Promega, Progenie Molecular, Secugen, Sistemas Genómicos, Venter Pharma, Vitro, Vivia Biotech, Werfen, Whole Genix, ZeClinics. |


**SDG 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.**

Students are more and more interested in biotechnology. Since 2015, the number of students enrolled in university studies in biotechnology, both undergraduate and masters level, has increased about 4% each year. In 2021, there were more than 8,700 students enrolled in these programmes. Moreover, 60% of these 8,700 students are women.

Biotechnology remained among the degrees that require the highest marks on university entrance exams in 2021. At 19 of the 24 public universities that offer biotechnology studies, this degree is among the 10 highest admissions scores required.

| | |
|---|---|
| Universities and training centres | IQS, Alfonso X El Sabio University, CEU San Pablo University, University of Navarra and Universidad Europea de Madrid. |




**SDG 5. Achieve gender equality and empower all women and girls.**

The biotechnology sector has had the highest number of women working in R&D for over a decade. Biotechnology has great female researchers, executives and entrepreneurs. At companies in the biotechnology sector, nearly 60% of R&D staff are women (Spanish average: 31%).


**SDG 6. Ensure availability and sustainable management of water and sanitation for all.**

Biotechnology helps promote more sustainable water use with production processes and crops that help reduce demand for water. It also ensures water is readily available and clean by purifying wastewater and identifying contaminants.

Through biotechnology techniques, microorganisms, microalgae and cyanobacteria are used to purify and eliminate chemical contaminants from water. They can also detect contaminants.

| | |
|---|---|
| Sustainability and water management | AINIA, AlgaEnergy, Bayer, Biomar, Biobide, Biorizon Biotech, Drops&Bubbles Tecnologia, Eurosemillas, Leitat. |


## SDG 7. Ensure access to affordable, reliable, sustainable and modern energy for all.

Biotechnology offers up alternatives to produce clean energy and ensure more efficient power use, as well as reusing urban and forestry waste and byproducts from certain industries, reducing their impact on the environment. Alternative sources of biomass, from forestry and agriculture, are used more and more to produce clean, renewable energy.

| | |
|---|---|
| Biofuels | ADM Biopolis, AINIA. Algaenergy, Spanish Bank of Algae, Leitat, CENER, Neiker, CICYTEX and CLAMBER. |


## SDG 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.

Biotechnology companies in 2020 generated over €10.3 billion in income, which is 0.9% of the Spanish GDP. Plus, the turnover of these companies contributed 1.1% to the GDP that year.

They also accounted for 120,000 jobs, 0.7% of total employment nationwide, up 3.5%. Furthermore, these are quality jobs, as the salary per employee is nearly double the national average.




## SDG 9. Build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation.

The biotechnology sector is highly innovative and each of the activities by biotechnology companies involves innovation.

Plus, as we've seen in previous sections, the number of companies increases every year and the sector helps generate quality employment.

The biotech sector invests more in R&D relative to production than nearly any other.


## SDG 12. Ensure sustainable consumption and production patterns.

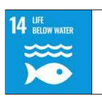
Biotechnology applications promote responsible consumption and production. Biological products are reused, recycled, turned into energy or can be composted, contributing to the circular economy.

| | |
|---|---|
| Waste valorisation | AINIA, BDI biotech, CLAMBER, CENER, CICYTEX, Cultiply, Leitat, Natac Group, MOA Foodtech and Tebrio. |


## SDG 13. Take urgent action to combat climate change and its impacts.

Biotechnology helps mitigate the effects of climate change by replacing materials based on fossil fuels with biological ones, such as bioplastics or biopesticides, with the resulting reduction in $CO_2$ emissions.

| | |
|---|---|
| Cutting $CO_2$ | AlgaEnergy, Agrocode, AINIA, Baye, Biorizon Biotech, CICYTEX and Tebrio |
| Improving air quality | ISCIII and Ramón y Cajal Institute. |




## SDG 14. Conserve and sustainably use the oceans, sea and marine resources for sustainable development.

Biotechnology helps preserve marine ecosystems using techniques to monitor marine habitats and clean polluted waters with microorganisms, microalgae and cyanobacteria.

| | |
|---|---|
| Growing algae | AlgaEnergy, Biorizon Biotech and Spanish Bank of Algae. |
| Microbiological treatment | ADM Biopolis and Leitat. |
| Fish health and production | Biomar and Tebrio. |




## SDG 15. Sustainably manage forests, combat desertification, halt and reverse land degradation and halt loss of biodiversity.

Biotechnology products are helping preserve life on earth and stop the loss of biodiversity. In fact, according to data from the ISAAA[1], 183 million hectares of land have been saved in just over 20 years thanks to biotechnology crops and the environmental impact quotient has dropped 19%.

| | |
|---|---|
| Reducing soil erosion | Bayer, Bioibérica, Neiker and Tebrio. |
| Reducing the need for arable land | AINIA, AlgaEnergy, Biorizon Biotech, Pevesa and Tebrio. |


## SDG 17. Strengthen the means of implementation and revitalise the global partnership for sustainable development.

The Sustainable Development Goals require complex solutions, which makes it essential to forge alliances with other stakeholders in the system. Public-private partnership and international aspirations have allowed biotechnology to have a huge social, environmental and economic impact for decades now.

In 2021, our companies established 220 partnerships for R&D, clinical development, field trials or product distribution. Half of these partnerships were to collaborate with another biotech company and with public organisations, foundations or research centres.

Even the association for the biotechnology sector in Spain, AseBio, is a partnership between companies and the public sector to promote the biotechnology sector, valorising the excellent science produced at academic institutions and companies in the country. This spirit of public-private partnership and ecosystem-building vision is in the DNA of AseBio and the sector as a whole.

[1] https://www.isaaa.org/resources/publications/briefs/54/executivesummary/default.asp

# WHO'S WHO

# BOARD OF DIRECTORS

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CHAIRWOMAN - MERCK

**BELÉN BARREIRO**
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**ELENA RIVAS**
2nd VICE-PRESIDENT
- ARRAYS FOR CELL NANODEVICES

**JAVIER TERRIENTE**
3rd VICE-PRESIDENT
- ZECLINICS





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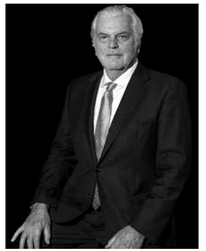
3P BIOPHARMACEUTICALS

**ANTONIO BAÑARES**
ABBVIE

**CARLES DOMÈNECH**
ABILITY PHARMA

**IGNACIO URBEIZ**
ADL BIOPHARMA



**AUGUSTO RODRÍGUEZ-VILLA**
ALGAENERGY

**ROCÍO ARROYO**
AMADIXA

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AMGEN

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ENRIQUE SAMPER
NIMGENETICS



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BELÉN SOPESÉN
PHARMAMAR

ANTONIO LÓPEZ
SCIENCE & INNOVATION LINK OFFICE

GURUTZ LINAZASORO
VIVEBIOTECH

# COMMITTEES

**HEALTHCARE COMMITTEE**
Led by 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 the sustainability of the system.

• To raise awareness of the contributions biotechnology makes to help 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**
Led by 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 facilitate development of the connection between biotechnology and new technology.

• 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 technolgy**
Coordinator: Elisa Díaz (Merck)

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

# COMMITTEES

**AGRIFOOD COMMITTEE**
Led by 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**
Led by Carlos Rodriguez-Villa (AlgaEnergy)

## 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**
Coordinator: Carlos Rodriguez-Villa (AlgaEnergy)

# COMMITTEES

**TALENT AND COMMUNICATION COMMITTEE**
Led by Elena Rivas (A4Cell)

## GOAL

• To encourage members to get involved in communicating biotechnology in the association's daily endeavours.

• To consolidate collaborations among members to amplify and anchor messages on the sector, building 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 young 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 Diaz (Zendal)

• **Talent, entrepreneurship and diversity**
Coordinator:
Tomás Alarcón
(3P Biopharmaceuticals)

# BUSINESS MEMBERS

3P BIOPHARMACEUTICALS

ABBVIE

ABILITY PHARMACEUTICALS

ACCURE THERAPEUTICS

ACKERMANN INTERNATIONAL

ADL BIONATUR SOLUTIONS

ADL BIOPHARMA

ADM BIOPOLIS

ADMIT THERAPEUTICS

ADNTRO

AFFIRMA BIOTECH

ABT AGAROSE BEAD TECHNOLOGIES

AGRENVEC

AGROCODE BIOSCIENCE

AKRN CONSULTING

ALCALIBER



ALGAENERGY

ALGENEX

ALIRA HEALTH

ALLADVICE REGULATORY CONSULTANTS

ALLINKY BIOPHARMA

ALMIRALL

ALTA LIFE SCIENCE

AMADIX

AMGEN

AMS BIOPHARMA LABORATORY

ANTARES CONSULTING

APTATARGETS

APTUS BIOTECH

AQUILÓN CYL

ARACLON BIOTECH

ARCHIVEL FARMA

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ARCHIVEL FARMA

ARQUIMEA

ARRAYS FOR CELL NANODEVICES

ARTHEX BIOTECH

ARTINVET

ASABYS PARTNERS

ASCIL BIOPHARM

ASPHALION

ASTRAZENECA

ATRYS HEALTH

AYMING

AZUR GLOBAL NUTRITION EUROPE S.L.

BAYER CROPSCIENCE

BCN HEALTH

BDI (BIOTECHNOLOGY DEVELOPMENT FOR INDUSTRY S.L.)

BEST MEDICAL DIET



BIOBIDE (BBD BIOPHENIX)

BIOSCROSMO

BIOCROSS

BIOHOPE SCIENTIFIC SOLUTIONS FOR HUMAN HEALTH

BIOIBÉRICA

BIOLAN

BIOINGENIUM

BIOLAN HEALTH

BIOMAR MICROBIAL TECHNOLOGIES

BIOMARIN

BIOMEDICA MOLECULAR MEDICINE

BIONET INGENIERÍA

BIONOS BIOTECH

BIOREPOS

BIORIZON BIOTECH

BIOSEARCH LIFE

# BUSINESS MEMBERS

BIOSEQS GENOMICS

BIOSERENTIA

BIOSFER TESLAB

BIOTECHNOLOGY BUSINESS INSTITUTE

BIOTECHVANA

BIOTOOLS

BME GROWTH

BRISTOL MYERS SQUIBB

BTI BIOTECHNOLOGY INSTITUTE

CAIXA CAPITAL RISC

CAPITAL CELL

CARTHAGENETICS

CIMERA (CELLAB)

CELTARYS BIOTECH

CESIF

CYCLOMED TECHNOLOGIES



COOL CHAIN LOGISTICS

CORIFY CARE

CRAZY SCIENCE & BUSINESS

CRB INVERBIO

CULTIPLY

DINAMIZA

DIOMUNE

DISIT BIOTECH

DIVERSA TECHNOLOGIES

DOBECURE

DOITPLENOPTIC

DR. HEALTHCARE

DREAMGENICS

DROPLITE TECHNOLOGIES

DSM

ELZABURU

# BUSINESS MEMBERS

ENZYMLOGIC

EUROGENETICS

EURONEXT

EUROPEAN RESEARCH BIOLOGICAL CENTER (ERBC)

FERRER

FLOMICS BIOTECH

GATE2BRAIN

GÉNESIS BIOMED

GENETRACER BIOTECH

GENÓMICA

GILEAD

GRADOCELL

GSK (GLAXOSMITHKLINE)

GRIFOLS

GRIFOLS ENGINEERING

GRUPO CELLUS



HEALTH IN CODE

HIGHLIGHT THERAPEUTICS

HISTOCELL

HOFFMANN EITLE

ILLUMINA

IMERETI

IMMUNOSTEP

INCYTE

INGENASA

INGULADOS RESEARCH

INHIBITEC ANTICUERPOS

INNOQUA TOXICOLOGY CONSULTANTS

INNOUP FARMA

INTEGRA THERAPEUTICS

INTEGROMICS

INVIVO CAPITAL PARTNERS

# BUSINESS MEMBERS

IOMED MEDICAL SOLUTIONS

INVEREADY

ISERN PATENTES Y MARCAS

IUL

JANSSEN-CILAG

KAUDAL CONTROL Y GESTIÓN DE PROYECTOS

KLINEA INGENIERÍA FARMACÉUTICA

LABGENETICS

LABORATORIOS LETI

LABORATORIOS RUBIÓ

LAMINAR PHARMA

LENTISTEM BIOTECH

LEUKOS BIOTECH

LBERA BIO

LIFE LENGTH

LIFESEQUENCING



LIM GLOBAL

LIMNOPHARMA

LONZA

MABXIENCE

MED-IVD TECH

MEDMESAFE

MERCK

MIAKER DEVELOPMENTS

MICROOMICS

MIKROBIOMIK

MILTENYI BIOTEC

MIMARK DIAGNOSTICS

MINORYX THERAPEUTICS

MOA BIOTECH

MSD

NANOIMMUNOTECH

# BUSINESS MEMBERS

NANOLIGENT

NATAC GROUP

NATUREMIMETIX

NETSERIL

NEURAL THERAPIES

NEUROFIX

NIMGENETICS

NORAYBIO

NOSTRUM BIODISCOVERY

NORAY BIOSCIENCES GROUP

NOSTRUM BIODISCOVERY

NOVARTIS

NOVO NORDISK

NOWTURE

NOWTURE

NUCAPS NANOTECHNOLOGY

ONCOHEROES BIOSCIENCES



ONECHAIN IMMUNOTHERAPEUTICS

ONENA MEDICINES

OPERON

ORYZON GENOMICS

OWL

PALMEERA FARMS

PALOBIOFARMA

PEACHES BIOTECH

PEPTOMYC

PEVESA

PHARMAMAR

PRODUCTLIFE GROUP

PROGENIE MOLECULAR

PROGENIKA BIOPHARMA

PROMEGA

PROTEOS BIOTECH

# BUSINESS MEMBERS

ROCHE FARMA

SANIFIT

SANOFI

SARTORIUS STEDIM

PROTOQSAR

PVPHARM®

QGENOMICS

QUALITECFARMA

REIG JOFRÉ

REMAB THERAPEUTICS

SCIENCE & INNOVATION LINK OFFICE (SILO)

SECUGEN

SERMES CRO

SIGMA-ALDRICH QUÍMICA

SISTEMAS GENÓMICOS

SOM BIOTECH



SPECIPIG

SOBI (SWEDISH ORPHAN BIOVITRUM)

SYLENTIS

TEBRIO

TECBIOCEL, S.L.

TECNIC BIOPROCESS EQUIPMENT MANUFACTURING

TIGENIX

TRESCA INGENIERÍA

VALTRIA

VAXDYN

VENAIR BIOTECH

VCN BIOSCIENCES

VENTER PHARMA

VETGENOMICS

VITRO

VIVACELL BIOTECHNOLOGY

# BUSINESS MEMBERS

VIVEBIOTECH

VIVIA BIOTECH

VIVOTECNIA RESEARCH

VLPBIO

WERFEN

WHOLE GENIX

WORLD COURIER

YSIOS CAPITAL PARTNERS

ZECLINICS

ZENDAL (BIOFABRI)

ZYMVOL BIOMODELING



# MEMBERS

AGENCIA IDEA

AINIA

BANCO ESPAÑOL DE ALGAS

BASQUE HEALTH CLUSTER

BIOCAT

BIOFARMA

BIOIB

BIOVAL

FUNDACIÓN CENER-CIEMAT

BIOFARMA

CICYTEX

CIBER

CNIO

CSIC

FEDERACIÓN ASEM

FIBAO

# MEMBERS

FISEVI

CRG

GEICAM FOUNDATION

IMDEA FOUNDATION

MEDINA FOUNDATION

PROGRESS AND HEALTH FOUNDATION

GENMIC

IGTP

GOVERNMENT OF LA RIOJA. DG INNOVATION

IMIBIC

IBIS

IBIMA

INSTITUTE FOR BUSINESS COMPETITIVENESS (ICE)

IISFJD

+12 INSTITUTE

IIS LA FE



IRYCIS

ISCIII

IQS

IRB BARCELONA

VETERINDUSTRIA

LEITAT

NEIKER

BARCELONA SCIENCE PARK

MADRID SCIENCE PARK

PROEXCA

CLAMBER PROJECT

PTS GRANADA

SEBBM

SEHH

SENC

SEOM

SODENA

ALFONSO X EL SABIO UNIVERSITY

CEU SAN PABLO UNIVERSITY

UNIVERSIDAD EUROPEA DE MADRID

UNIVERSITY OF NAVARRA

# METHODOLOGY

## CHAPTER 1 - R&D

For this chapter we compiled the results of the Survey on Biotechnology Use and statistics on R&D activities from the National Statistics Institute. 2020.

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

## CHAPTER 2 - FUNDING

The data in chapter 2 was compiled from information from the State Research Agency (AEI), the Spanish Venture Capital and Private Equity Association (ASCRI), the National Innovation Company (ENISA), the Centre for the Development of Industrial Technology (CDTI), 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/portal/site/universidades/menuitem.78fe777017742d34e0acc310026041a0/?vgnextoid=3b80122d36680710VgnVCM1000001d04140aRCRD ), 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 El Pais website on 30 May 2022 (https://elpais.com/especiales/universidades/titulacion/universidad), which were provided by the universities except for those in 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 2020 Survey on Biotechnology Use and INE Statistics about R&D activities.



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.

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. Ministry of Equality.

https://www.inmujeres.gob.es/MujerCifras/CienciaTecnologia/Empleo.htm

## CHAPTER 4 - BUSINESS FABRIC

This section was compiled as follows:
- 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

We compiled data from the COTEC Survey on Social Perception of Innovation (https://cotec.es/observacion/encuesta-de-percepcion-social-de-la-innovacion/0e696b76-87a8-1d3c-8c7e-7a8f4d6097d1).
The data on perception of the biotechnology sector was obtained from a survey of AseBio members, who were asked to rate 20 factors on how they had affected the biotechnology sector in 2021.

## CHAPTER 6 - RESULTS OF THE BIOTECH

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 2021, we requested information from members on their scientific publications in biotechnology, not including communications or posters at congresses or fairs, or publications signed by research centres or universities that don't cite the relationship with studies for business projects.

• 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 Thomson Reuters (now 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 Organization (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 2021 and their distribution by areas of activity were put together by consulting AseBio members.



## CHAPTER 7 - COLLABORATION AND INTERNATIONALIZATION

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

The results on partnerships established by biotech companies were obtained from members and by checking press releases from the various organisations.

## CHAPTER 8 - IMPACT

The data for sections 8.1 and 8.2 in chapter 8 was obtained from a sample of companies collection 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 (2010-2020) 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.

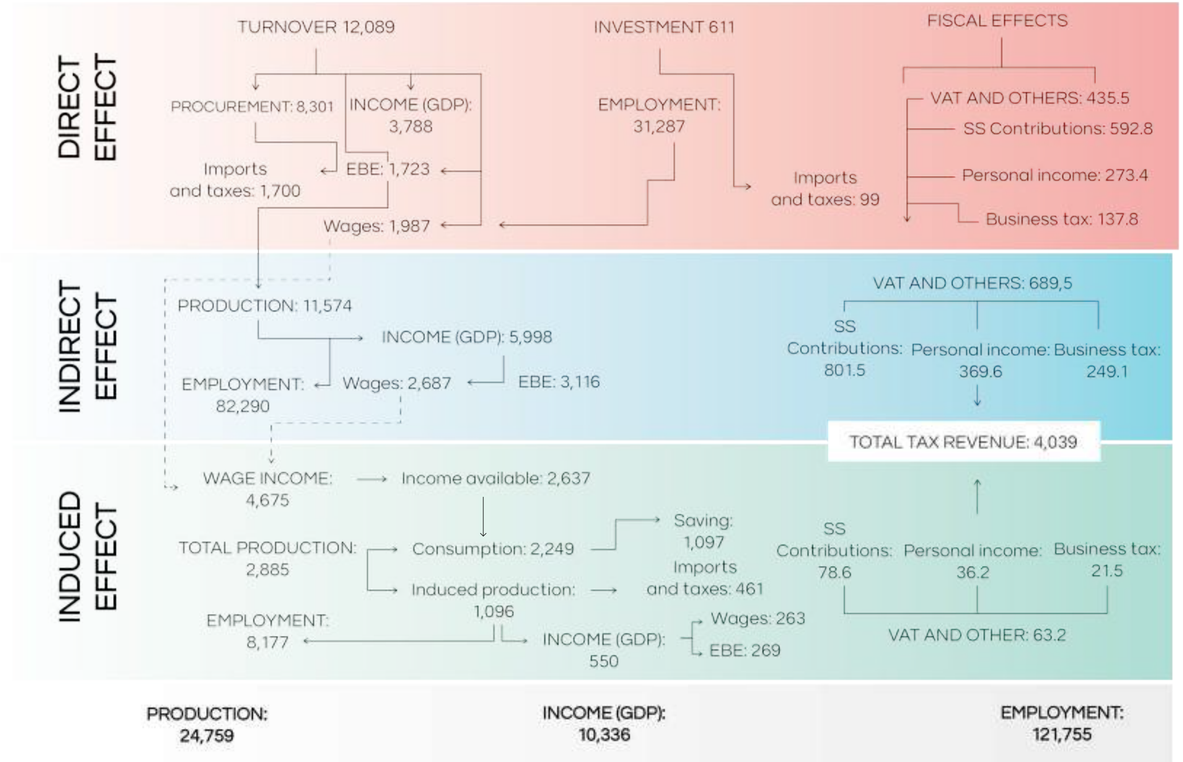
For these companies, we started with the total employment figures in the INE survey and did an indirect estimation of the other benchmark levels, taking into account both the general ratios in the National Accounting and the specific ones for strictly biotechnology activities calculated previously.

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, plus the induced impact generated by direct and indirect salaries dependent on this activity.

The section on Biotechnology on the 2030 Agenda was compiled with information on the activity, products and services of each member from their websites and classification based on their relationship with the Sustainable Development Goals.

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

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