Spanish White Biotech Pipeline*

TECHNOLOGIES

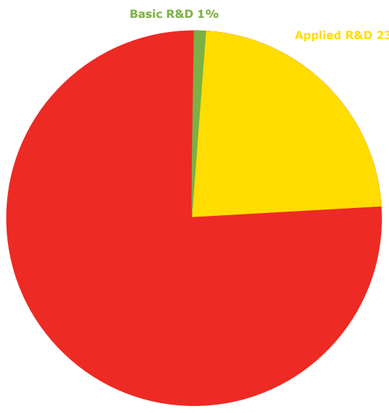
LOGO	COMPANY	NAME	INDICATION	BASIC R&D	APPLIED R&D	READY FOR EXPLOTATION	AVAILABLE	TECHNOLOGY TRANSFER IN PROGRESS	PATENT
	ALGAENERGY		Microalgae Production Technology for several applications				✓	✓	✓
	ALGAENERGY		Microalgae production facilities, technologies, control and harvesting systems				✓	✓	✓
	BIOCHEMIZE		Enzymatic technological platform for advanced esterification reactions				✓	✓	
	BIOCHEMIZE		Enzymatic technological platform for advanced aldolic reactions				✓	✓	
	BIOCHEMIZE	PB	Screening for microbial and enzymatic biocatalysis				✓	✓	✓
	BIOCHEMIZE	SC-enz	Enzymatic screening for modification of chemical structures				✓	✓	✓
	Bioibérica	CropScan	Bioinformatic tools for genetic diagnosis				✓		
	Biomedal	CASCADE	Bacterial expression system				✓	✓	✓
	Bionaturis	FLYPIDS	Recombinant expression of second generation vaccines (VLPs, chimeric, subunits)				✓		✓
	Bionaturis	FLYLIFE	Baculovirus expression system. MVB, WSVB, upstream development, downstream development, analytical development, scale-up				✓	✓	✓
	BIONET INGENIERÍA	BIONET	Serial Membrane filtration units				✓		
	BIONET INGENIERÍA	BIONET	Fermentation technologies				✓		
	BIONET INGENIERÍA	BIONET	Membrane filtration technologies				✓		
	BIONET INGENIERÍA	BIONET	Serial 5 L. Bioreactor				✓		
	BIONET INGENIERÍA	BIONET	Serial 350-1000 L. Bioreactor				✓		
	BIONET INGENIERÍA	BIONET	Serial CIP units				✓		
	BIOPOLIS	Bio-Cpe	High added value compounds extraction				✓		
	BIOPOLIS	Bio-CI	Recombinant protein expression for therapeutic and diagnostic application				✓		
	Bioraw		Industrial fermentation				✓		
	Bioraw	Ps	Sterile final pharmaceutical forms						
	BIOSEARCH LIFE		Screenings for antimicrobial, antiobesity, inhibitory of cholesterol absorption activity				✓		
	BIOSEARCH LIFE		Testing laboratory accredited by ENAC according to ISO17025				✓		
	BIOSEARCH LIFE	GO-FUNCTIONAL®	Functional food development service (Laboratories, Pilot Plant, Sensory analysis, Stability trials & Packaging)				✓		
	Ecocelta Galicia S.L.		Biosimilars monoclonal antibodies Platform				✓		
	Fundacion MEDINA	MEDiscovery	Bioactive Molecule Discovery Platform				✓		
	Fundacion MEDINA	MEDmicro	Microbial Fermentation & Scale Up Platform				✓		
	Fundacion MEDINA	MEDchemistry	LCMS & NMR Analytical Platform				✓		
	Fundacion MEDINA	MEDScreen	High Throughput Screening of Biotechnological Products				✓		
	Fundacion MEDINA		Bioanalysis mass spectrometry platform				✓		
	GENOMICA	AUTOCLART PLUS	Microplate processor to visualize and read samples to diagnosis.				✓		✓
	Ingeniatrics	FLOW FOCUSING ®	One step microencapsulation producing small & homogeneous spheres, core-shell, double-shell particles				✓	✓	✓
	Ingeniatrics	FLOW BLURRING ®	Highly efficient spray of extremely fine droplets production				✓	✓	✓
	Ingeniatrics	MICROPARTICLES MANUFACTURING	Tailored in-plant scaled-up manufacturing				✓	✓	✓
	Ingeniatrics	ONENEB	Improved sensitivity and robustness analytic nebulizer and micronebulizer for spectrometry systems				✓	✓	✓
	Ingeniatrics	FBM (Flow Blurring® Metal)	High throughput nebulizer for material process: drying, pulverisation, etc. Able to operate with highly viscous materials				✓	✓	✓
	Ingeniatrics	CELLENA	User-friendly bioencapsulation portable platform to encapsulate high molecular weight compounds, microorganisms and cells				✓	✓	✓
	Ingeniatrics	FLOW SPRAY-DRYER	Brand-new spray-drying and spray-chilling equipment integrating proprietary technology emitters for highly accurate and efficient microparticles production				✓	✓	✓
	Ingeniatrics	MICROPARTICLES DEVELOPMENT	Customised CRO microencapsulation services for cosmetics, chemicals, consumer goods, including SPHERES, CORE-SHELL and DOUBLE SHELL structure				✓	✓	✓
	Ingeniatrics	ATOMIZATION EQUIPMENT / COATING SYSTEMS	Development and manufacturing of proprietary technology nebulizers, atomisers, and equipment or devices including it / coating systems				✓	✓	✓
	InKemia IUCT group	GC-SOLV	Substitution for green safer solvent from renewable resources in different industrial applications				✓		
	InKemia IUCT group	CG-Bio-GMO	Molecular biology: genetically modified microorganism				✓		
	InKemia IUCT group	Bio-HTB	High throughput biotechnological synthesis of small molecules				✓		
	Laboratorios LETI		Protein Purification				✓		
	Life Length	TAT	Telomere measurement				✓		
	Lonza Biologics Porriño		Stirred bioreactors 5.000 & 10.000 L. scale & single-use bioreactors				✓		
	Lonza Biologics Porriño		Custom manufacturing of monoclonal antibodies and recombinant proteins using mammalian cell culture				✓		
	Lonza Biologics Porriño		Analytical Services for the Biotechnology Industry				✓		
	NANOIMMUNOTECH	NITBIOSENSING	Colorimetric biosensing platform based on the innovative properties of nanotechnology				✓		
	NANOIMMUNOTECH	HEATSENS, innovative nanobiosensing technology for ultra-sensitive, rapid and easy detection of analytes of interest (NITBIOSENSING). Thermal biosensor based on visual detection by colour change in a support where an analyte is present, produced by heat	Detection of analytes in very different kinds of areas such as human and animal diagnostics, environment, agri-food, cosmetic, pharmaceutical, etc.				✓		
	NANOIMMUNOTECH	LinkOriented Kits: Kits for oriented conjugation of proteins on nanoparticles. (NITBIOCONJUGATION)	Lateral flow. Design of biosensors. Bioconjugation. Microscopy probe. Immunogold. Immunosensing				✓		
	NANOIMMUNOTECH	NITgold Cit: Portfolio of Citrate-coated gold nanoparticles (different sizes available) (NITPARTICLES)	Design of biosensors Target-specific drug-delivery Lateral flow tests Imaging probes for dark-field microscopy Flow cytometry Cancer photothermal therapy Catalysis Optoelectronic				✓		
	NANOIMMUNOTECH	NITgold COOH-PEG: Portfolio of COOH-PEG coated gold nanoparticles (different sizes available) (NITPARTICLES)	Design of biosensors Drug delivery Colorimetric probes Cellular uptake				✓		
	NANOIMMUNOTECH	NITgold Lipoic: Portfolio of Lipoic gold nanoparticles (NITPARTICLES)	Design of biosensors Target-specific drug-delivery Imaging probes for dark-field microscopy Cancer photothermal therapy Optoelectronic				✓		
	NANOIMMUNOTECH	NITgold clusters: Gold nanoclusters (different sizes available) (NITPARTICLES)	Bioconjugation Immunocytochemistry Microscopy probe Cellular uptake Immunogold Immunosensing Catalysis Optoelectronic				✓		
	NANOIMMUNOTECH	NITmagold : Portfolio of gold-coated magnetic nanoparticles (different surfaces available) (NITPARTICLES)	Magnetic separation Biosensing Magnetic hyperthermia Drug delivery				✓		
	NEIKER Tecnalia - Instituto Vasco de Investigaci		Protein purification				✓		
	NEIKER Tecnalia - Instituto Vasco de Investigaci		Soil microorganism detection				✓		
	NEIKER Tecnalia - Instituto Vasco de Investigaci		Development of microalgae culture strategies to obtain high lipid biomass content						
	NEOL BIOSOLUTIONS	MICROBIOTOOLS	Selection, optimization and scale-up of microorganisms for industrial applications				✓	✓	
	NEOL BIOSOLUTIONS	MICROBIOIL-1	Production of microbial oils from crude glycerine				✓	✓	✓
	NEOL BIOSOLUTIONS	MICROBIOIL-2	Production of microbial oil from lignocellulosic residues (wheat straw)				✓	✓	✓
	Plebiotic	PleMD v2	Molecular Dynamics software - drug discovery, analysis of action mechanisms				✓		
	Plebiotic		Reverse docking, for repositioning of existing drugs				✓		
	Plebiotic	PleMD	Molecular Dynamics solution				✓		✓
	SISTEMAS GENÓMICOS	Massive sequencing applied to clinical diagnosis and medical informatics technologies	Platforms for massive sequencing studies of genomics, transcriptomics, molecular biology, genetic diagnosis ...				✓		
	Vytrus Biotech		Plant cell cultures technology for the development of dermocosmetic products						
	BIOPOLIS	Screening of biological activities	Screening of interesting biological activities either from comlex samples or selected strains from culture collections. Optimization of growth and biocatalysis reaction.						
	BIOPOLIS	Human Milk Oligosaccharides	Biotechnological Production of Human Milk Oligosaccharides as High-added Value Active Ingredients						✓
	BIOPOLIS	Scale up of bioprocess	Fermentation and Downstream process from 1 L to 300 L bioreactors				✓		
	ENTRECHEM	Bioaugmentation strategies for optimization of biogas production	Bioenergy, waste management				✓		
	Leitat	Technology Medical informatics	Technology Medical informatics				✓		
	Leitat	Bioactive compounds extraction and recovery from Biomass	Bioactive compounds extraction and recovery from Biomass				✓		
	Leitat	Biomass pretreatments	Biomass pretreatments (chemico-physical and biological pretreatments)				✓		
	Leitat	Biocatalysis development	Biocatalysis development for the syntehsis of antimicrobial molecules				✓		
	Leitat	Solid State Fermentation (SSF)	Solid State Fermentation (SSF)				✓		
	Leitat	Protein hydrolysis	Protein hydrolysis				✓		
	Leitat	Microbial Fuel Cells (MFC)	Microbial Fuel Cells (MFC). Partial anaerobic digestion of wastewater for MFC operation				✓	✓	
	Leitat	Inhibitors screening	Antimicrobial / antifungal /antibiofouling and quorum sensing inhibitors screening						
	Leitat	Biosurfactant production	Biosurfactant production						
	Leitat	Protein purification	Protein purification						
	Leitat	Enzyme immobilization	Enzyme immobilization						
	Leitat	Anaerobic digestion and partial anaerobic digestion	Anaerobic digestion and partial anaerobic digestion						
	NEOL BIOSOLUTIONS	TRIBIOPLAST	Production of biopolymers					✓	✓
	NEOL BIOSOLUTIONS	MICROBIOIL-3	Microbial production of tailor-made oils and oleochemicals					✓	✓
	Plebiotic		Molecular design of antibodies				✓		
	Vytrus Biotech		Plant cell cultures technology for recombinant proteins production						
	Ingenasa	Multi DETECT	Detection of diferent infectious agents in a single multiplex assay, based on microarray technology.				✓		

BIOFUELS

LOGO	COMPANY	TYPES OF BIOFUEL	RAW MATERIAL	GENERATION	ACTIVITY	ADDED VALUE
	ALGAENERGY	Biomass, biodiesel, bioethanol, biogas	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	3rd	Laboratory production & genetic engineering	Higher yield than 1st generation: No conflict with human food, Use of non agricultural land, Grow on either wastewater, brackish water or seawater, daily harvesting
	BANCO ESPAÑOL DE ALGAS	Biomass, biodiesel, bioethanol, biogas	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	3rd	Fast growing strains, isolation of new species, selection of strains	New biodiversity & cultivation systems, extremophiles, new techniques, connection with pilot plant units at real conditions, and R&D groups
	BIOPOLIS	Biodiesel, bioethanol, biogas	Other	2nd	Development of optimised microorganisms for biofuels	Process optimisation
	Camelina Company España	Liquid biofuel	Other	2nd	Sustainable feedstock	Sustainable feedstock for 2nd generation liquid biofuel. Development for aviation liquid biofuel: biojetfuel
	Camelina Company España	Liquid biofuel	Other: Camelina oil	2nd	Sustainable feedstock	Sustainable feedstock for 2nd generation liquid biofuel. Biodiesel
	Camelina Company España	Biojetfuel for the aviation industry	Other: Camelina oil	2nd	Feedstock production	Sustainability. Drop in fuels
	ENTRECHEM	Biogas	Agricultural wastes / Domestic biomass (from urban waste)	1st	Bioaugmentation strategies	Identification of key microorganisms in anaerobic digesters to implement bioaugmentation strategies and optimize performance
	Fundación Parque Científico Tecnológico Aula Dei	Biodiesel	Other: no-food crop	2nd	Sustainable feedstock	Sustainable feedstock for 2nd generation liquid biofuel
	Ingeniatrics	All	Other: fuel delivery	1st	Optimised fuel atomization	Diminishes emissions - gas and solid particles, makes combustion more efficiently. Capacity to make viscous materials burn, e.g. glycerine
	Ingeniatrics	All	Other: emissions	1st	Treatment of NOx Emissions	Diminishes NOx emissions utilising urea with improved efficiency
	InKemia IUCT group	Biofuels for diesel engines	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	2nd	Development of new biofuels and other biotech products	100% of biomass (oil) use, as it converts glycerine into a biofuel with improved properties compared to famers
	InKemia IUCT group	Heating	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	2nd	New biofuel for heating in industrial furnaces	100% biomass use. Substitutes fuel oils. Economically viable. Does not need preheating of the fuel oils for ignition
	InKemia IUCT group	Synthesis and purification of biofuels either by chemical or biotechnological routes	Other: All	1st / 2nd	Process optimisation of biofuel production	One stop shop for biofuel process optimization
	Leitat	Biodiesel	Other: oils	1st / 2nd	Transesterification process development	Recovery of oily waste. More sustainable process
	Leitat	Biogas	Agricultural wastes / Livestock biomass	2nd	Pilot plant demonstration	Process optimized. Valorisation of a waste with limited valorization options. Pretreatment optimization
	Leitat	Cogeneration/Heating	Agricultural wastes	2nd	Energy studies	Study the technical feasibility of the power source
	Leitat	Bioethanol	Agricultural wastes	2nd	Pretreatment of raw material	Improvement of the saccharification efficiency by chemical or enzymatic pathways
	Leitat	Electricity	Other: Organic effluents (wastewater)	2nd	Microbial Fuel Cell. Semi-pilot scale-up	Obtaining energy from organic waste effluent. Process optimisation.
	Leitat	All	Other: All	1st / 2nd	LCA	Quantification of the environmental improvements and sustainability of different processes of energy production and biofuels
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Biogas	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	2nd	Biomass production	Technical feasibility study of the power source
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Cogeneration	Other: organic waste	2nd	Digestate Treatment	Technical feasibility study of digestate in agriculture
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Cogeneration	Other: organic waste	2nd	Nutrients removal	Increased profitability of processes through a combination of different organic sources
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Gas heating	Other: biomass	2nd	Improvement of biomass production systems	Reduced costs of intensive agricultural production systems: energy efficiency of production processes
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Diesel	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	1st	Crop agronomy	Improvement of farm profitability
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Diesel	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	2nd	Genetic transformation	Process profitability increase: mixed use algae
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Diesel	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	1st	Exploitation and valorisation of by-products	Integrated utilisation of biomass: energy and animal feed
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Diesel	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	2nd	Strains selection	Improving farm profitability
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Diesel	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	2nd	Biomass production	Significant yield increase in the production of biomass
	NEIKER Tecnalia - Instituto Vasco de Investigaci	Biogas	Other: organic waste	2nd	Biomethanisation process improvement	Recycling organic wastes to generate methane processes
	NEOL BIOSOLUTIONS	Biodiesel, renewable diesel	Crops (alcoholic, algae, aromatic, lignocellulosic, oleaginous)	2nd / 3rd	Development of technology	Valorisation of by-products. Non-competition with food raw materials. High yield production of microbial oils

*Based on data provided by ASEBIO associated companies. JUNE 2017

TECHNOLOGIES



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Spanish White Biotech Pipeline 2017

An overview of industrial biotechnology projects currently developed by the Spanish biotech industry

ASEBIO, the Spanish Bioindustry Association, encompasses over 270 firms, associations, foundations, universities, technology and research centers which carry out activities directly or indirectly related to biotechnology.

The wide number of associates makes **ASEBIO** the most appropriate meeting platform to face up the challenges of developing the biotechnology sector in Spain.

Around 630 companies research and develop products in the Spanish biotechnology sector.

Visit the online version at http://pipelines.asebio.com/white/

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MINISTERIO DE ECONOMÍA, INDUSTRIA Y COMPETITIVIDAD

ICEX

Spanish White Biotech Pipeline*

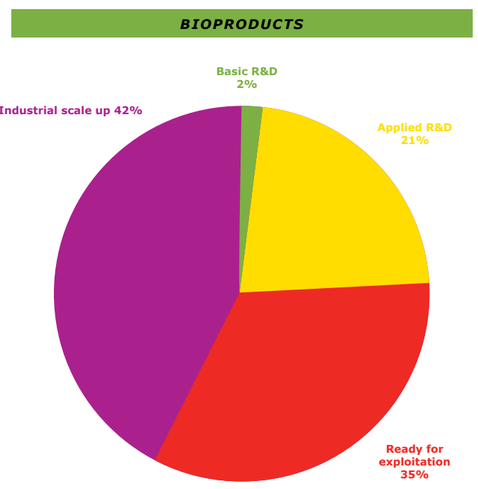
BIOPRODUCTS

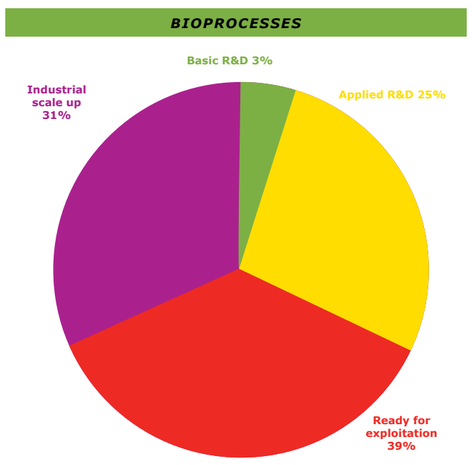
LOGO	COMPANY	NAME	INDICATION	BASIC R&D	APPLIED R&D	READY FOR EXPLOTATION	INDUSTRIAL SCALE-UP	AVAILABLE	TECHNOLOGY TRANSFER IN PROGRESS	PATENT
	ALGAENERGY		Microalgae products with excellent properties for several applications and sectors					✓	✓	✓
	ALGAENERGY	BLUE GOLD	C-Phycocyanin extract out of the microalgae Spirulina							
	Biomedal	ProPure rProtein A LCL Agarose	Immunoglobulin capture and purification affinity medium					✓	✓	✓
	Biomedal	ProPure rProtein G Rapid Flow	Immunoglobulin capture and purification affinity medium					✓	✓	✓
	Biomedal	ProPure rProtein A Rapid Flow	Immunoglobulin capture and purification affinity medium					✓	✓	✓
	Biomedal	ProPure rProtein G FastCAp	Immunoglobulin capture and purification cartridges					✓	✓	✓
	Biomedal	ProPure rProtein A FastCAp	Immunoglobulin capture and purification cartridges					✓	✓	✓
	Biomedal	rProtein G (3xC)	Synthetic derivative produced by recombinant expression. Antibody purification					✓	✓	✓
	Biomedal	rProtein A (4xZ)	Synthetic derivative produced by recombinant expression. Antibody purification					✓	✓	✓
	BIONET INGENIERÍA		Microalgae collection							
	BIONET INGENIERÍA		Cellulolytic and hemicellulolytic enzymes					✓		✓
	BIONET INGENIERÍA		Sugars					✓		
	BIONET INGENIERÍA		DDGS (Dried Distillers Grains with Solubles)					✓		
	Camelina Company España	Camelina Oil	High Omega3 and Vitamina E Content.					✓	✓	
	InKemia IUCT group	CAT-Bcun - Gbspum - Ssdeod	New catalyst Purine Phosphorilase Nucleoside					✓		✓
	InKemia IUCT group	CAT-Apudp / Bcpym / Hmudp	New catalyst pyrimidine phosphorilase nucleoside					✓		✓
	InKemia IUCT group	GC-S51	New solvent from renewable materials for synthesis of APIs					✓		✓
	InKemia IUCT group	GC-S78	New solvent from renewable materials for Crop protection					✓		✓
	InKemia IUCT group	SOL-LAOC4 / GC-S77 / GC-DMA	New solvent from renewable materials for metal degreasing and for Paint and varnishes from DMA					✓	✓	✓
	InKemia IUCT group	GC-S79	Solvents from renewable materials for the biodiesel sector					✓		✓
	InKemia IUCT group	BIO-TFT	Trifluorothymidine / Antiviral (Ophthalmic) / Herpes Cornea					✓	✓	✓
	InKemia IUCT group	GC-BIO-DAP / BIO-AP	2,6-diaminopurine deoxiriboside. Anticancer / 2,6-diaminopurine riboside. Antiviral. Anticancer					✓	✓	✓
	InKemia IUCT group	GC-BIO-DF / GC-BIO-F	2-deoxy-5-fluorouridine. 5-fluorouridine. Anticancer / Colon & Pancreas / Colon & Breast					✓	✓	✓
	NANOIMMUNOTECH	NITZIPPER	Family of products ready to be easily, quickly and efficiently bioconjugated (antibodies, dyes, enzymes, micro/nanostructures, peptides, molecules, linkers, etc.)					✓		✓
	SEPROX BIOTECH	Hydroxytyrosol	Production of Hydroxytyrosol by chemical and enzimatic syntesis					✓		
	TERACLON IDF	V32R	CRVO/RD/AMD					✓		✓
	AGROCODE BIOSCIENCE	Biopesticides	Extraction process development biopesticides from plant extracts and secondary metabolites of different microorganisms					✓		✓
	ALGAENERGY	AGRIALGAE	High quality agricultural biostimulant 100% based on microalgae enzymatic hydrolysis.					✓		
	Bioibérica	Cera Trap	Biological Attractants					✓		
	Bioibérica	Dacus Trap	Biological Attractants					✓		
	Bioibérica	Armurox	Plant protection (endogenous defense mechanisms)					✓		
	Bioibérica	AminoAlexin	Plant protection (resistance to biotic stress)					✓		
	Bioibérica	AminoQuelant Ca/Mg	Bioavailable Nutrition					✓		
	Bioibérica	Terramin	Biostimulant					✓		
	Bioibérica	Terra Humic	Biostimulant					✓		
	Bioibérica	Inicium	Biostimulant					✓		
	Bioibérica	StressSal	Biostimulant					✓		
	Bioibérica	Terra-Sorb	Biostimulant					✓		
	Bioibérica	Suzukii Trap	Biological Attractants					✓		
	Bioibérica	AminoQuelant-Cu	Bioavailable Nutrition					✓		
	Bioibérica	Flyral	Biological Attractants					✓		
	Biomedal	rProtein A Resins	Immunoglobulin capture and purification					✓		
	Biomedal	nLZ4-Cys	Cost effective ligand for antibody purification					✓		✓
	BIONET INGENIERÍA		Microalgae collection							
	BIOPOLIS	Bio-Enz	Bioconversion of desired molecules by the use of enzymes. Either with commercially available enzymes or using enzymes designed from scratch.					✓		
	Fundacion MEDINA	MEDgene	Microbial Genetic Bank					✓		
	Fundacion MEDINA	MEDiversity	Microbial Collections					✓		
	Vytrus Biotech		Plant cell cultures for dermatological applications							
	AGROCODE BIOSCIENCE	Trichoderma	Development production trichoderma with sterile process					✓		✓
	BIONET INGENIERÍA		n-butanol							✓
	BIOPOLIS	Human Milk Oligosaccharides	Biotechnological Production of Human Milk Oligosaccharides as High-added Value Active Ingredients							✓
	BIOPOLIS	Enzymatic preparations	Enzymes for the agrofood, chemical and pharmaceutical industries. We offer development and manufacturing of the desired enzymatic activities, including proteases, cellulases, lipases, amylases, xylanases, phytases, hydrolases, pectinases, among others.							
	Camelina Company España	Camelina germplasm	Screening and breeding program					✓	✓	
	Ecocelta Galicia S.L.	Sistema Vermifitas	Modular system of biological treatment of pig slurry and other liquid waste. The success of the results offered is based on the combination of a filter of worms and a purification tank with macrophytes.							✓
	InKemia IUCT group	BIO-K3	Menadione (vitamin K3)					✓		✓
	InKemia IUCT group	CAT-Halo1 / Halo2	Enzymatic mixture with hydrolytic activity / with lipase and protease activity					✓		
	InKemia IUCT group	Bio-EPS	New exopolysaccharides use as nutraceutical and cosmetics (8 compounds)					✓		
	InKemia IUCT group	BIO-CEM	New microorganisms for self healing concrete					✓		
	InKemia IUCT group	CAT-Halolip / Haloprot	New halolipase / New haloprotease					✓		
	Leitat		Protein hydrolysates							
	Leitat		Production of baits for insect control (protein hydrolsates as insect attractants). Pest fight.							
	Ecocelta Galicia S.L.	Ácidos fúlvicos	Organic amendment with stimulating power of the roots of plants. They possess the ability to chelate other nutrients , increasing its bioavailability by the plant.					✓		

BIOPROCESSES

LOGO	COMPANY	NAME	INDICATION	BASIC R&D	APPLIED R&D	READY FOR EXPLOTATION	INDUSTRIAL SCALE-UP	AVAILABLE	TECHNOLOGY TRANSFER IN PROGRESS	PATENT
	ALGAENERGY		Biomass integral valorisation process					✓	✓	✓
	BIOCHEMIZE	PB-est	Enzymatic and microbial platform for esterification of organic compounds					✓	✓	✓
	BIOCHEMIZE	PB-oxi	Enzymatic and microbial platform for oxidation of aromatic methylenes					✓	✓	
	BIOCHEMIZE	PB-met	Enzymatic and microbial platform for methylation of aromatic compounds					✓	✓	
	BIOCHEMIZE	PB-rac	Enzymatic and microbial platform for separation of racemic compounds					✓	✓	
	BIOCHEMIZE	PB-ald	Enzymatic and microbial platform for aldolic condensations					✓	✓	
	BIOCHEMIZE	PB-red	Enzymatic and microbial platform for reduction of oxygen functional groups					✓	✓	
	Biomedal	HISTAG-2nd-PHASE	Protein separation and purification of his-tagged proteins in aqueous two phase systems					✓	✓	✓
	Biomedal	LYTAG-2nd-PHASE	Protein separation and purification					✓	✓	✓
	Bionaturis	FLYLIFE	Baculovirus-based expression system at industrial scale (MVB, WVS, upstream, downstream)					✓	✓	
	Bionaturis	FLYPIDS	Recombinant expression of second generation vaccines (VLPs, chimeric, subunits)					✓		✓
	BIOPOLIS	Bio-Bph	Production of biopharmaceuticals, key organic compounds and green chemicals					✓		
	ENTRECHEM	Bioaugmentation for increased production of biogas	Bioenergy, waste management						✓	
	Fundacion MEDINA		Isolation of new natural products from microbial fermentations					✓		
	Fundacion MEDINA		Fermentation of new fungal and bacterial strains with biotechnological applications					✓		
	InKemia IUCT group	Bio-PROC	Substitution of chemical processes for bioprocesses					✓		
	InKemia IUCT group	Bio-SRC	Prospection, isolation, characterization and performance of new microorganisms in industrial biotechnology					✓		✓
	Laboratorios LETI		Production of protein extracts / allergens					✓		✓
	Leitat	Production of single cell protein (SCP)	Development of the process fo the production of single cell protein (SCP) from food industry waste and effluents							
	Leitat	Microbial Desalinition Cells	Material development and validation							
	NEOL BIOSOLUTIONS	TRIBIOPLAST	Biopolymers (medium and long chain poly-hydroxy-alkanoates)					✓	✓	✓
	NEOL BIOSOLUTIONS	MICROBIOL	Tailor-made microbial oils and oleochemicals from residues					✓	✓	✓
	PRAXIS	Proteins & Peptides	Micro-nano-formulation, aseptic filling and freeze-drying					✓	✓	✓
	Bioibérica		Biogas production plan project from fat							
	Bioraw	Ps	Aseptic lyophilisation and filling of APIs							
	Bioraw		Bacterial and fungal fermentation and DSP							
	Bioraw		Biotechnological production of APIs							
	Bioraw		Biotechnological production of steroids							
	Institut Quimic de Sarrià (IQS)	PROCEDIMIENTO PARA LA PRODUCCIÓN DE DHA por microalgas	Polyunsaturated fatty acids through a bioprocess with heterotrophic microalgae							✓
	Leitat	Fermentation process development	Biosurfactant production processes from commercial and renewable feedstock							
	Leitat		Enzymatic and physic-chemical protein hydrolisation processes. Collagen, keratine hydrolisates and vegetable protein hydrolisates for fertilizers, cosmetics and feed							
	Leitat	Strain improvement	Strains improvement without genetic modification (random mutagenesis and/or induction of natural transfer). Food and environmental application							
	Leitat		Biogas production from waste and effluents							
	Leitat	Microbial Fuel Cells	Development of Microbial Fuel Cells technology for electricity generation							
	Leitat	Novel strain isolation	Isolation of new producing strains and consortia for bioproduct obtaining. (e.g. biosurfactants, biopolymers, enzymes, etc.)							
	Leitat	Biocatalysis	Enzymatic and microbiological synthesis of antimicrobials							
	Leitat		Production of soil improvers based on peptides and amino acides. Fertilizers							
	Leitat		Production of crop agents based on antimicrobial peptides. Fertilizers							
	Leitat		Obteining protein hydrolysates							
	Leitat	Biocatalysis	Enzymatic synthesis of prebiotic ingredients							
	Leitat		Substitution of chemical processes by bioprocesses							
	Leitat		Enzymatic improvement of fats and fat valorisation							
	Leitat		Bioprocess for textile processing							
	NEIKER Tecnalia - Instituto Vasco de Investigaci		Production of Omega-3-Rich Oil from microalgae					✓		
	NEIKER Tecnalia - Instituto Vasco de Investigaci		Production of Recombinant Proteins					✓		
	NEIKER Tecnalia - Instituto Vasco de Investigaci		Production of carotenoids from microalgae							✓
	PROMEGA BIOTECH IBÉRICA	Manufacturing and Custom Capabilities	Our facilities meet or exceed quality standard requirements to ensure the on-time delivery of high-quality custom, bulk or specially designed products							
	Vytrus Biotech		Development of plant cell cultures for dermatologic pathologies							
	Vytrus Biotech		Development of plant cell cultures as new cosmetic actives ingredients							
	Vytrus Biotech		Recombinant proteins production through plant cell cultures platform							
	3P BIOPHARMACEUTICALS	CMO GMP certified	Analytics development and validation platform (API, IMP, IPC) for Biosimilars					✓		
	3P BIOPHARMACEUTICALS	CMO GMP certified	Analytics development and validation platform (API, IMP, IPC) for New biological entities					✓		
	3P BIOPHARMACEUTICALS	CMO GMP certified	Bioprocess Development/Optimisation Platform (USP/DSP)					✓		
	3P BIOPHARMACEUTICALS	CMO GMP certified	Freedom-to-operate platform in Bacteria, yeast and mammalian					✓		
	BIONET INGENIERÍA		Process Development/Optimization (USP and DSP)					✓		
	BIONET INGENIERÍA		Scale up and GMP facilities design					✓		
	BIOPOLIS	Bio-BPL	Process development for biopolymers production					✓		
	BIOPOLIS	Bio-Ctl	Bioprocesses / biocatalysis					✓		
	BIOPOLIS	Bio-Cl	Custom cloning and expression of recombinant protein					✓		
	BIOPOLIS	Bio-Snt	Biosynthesis of chemical compounds					✓		
	Bioraw		Development of fermentation and downstream processes at pilot scale and the subsequent industrial scale-up					✓		
	Bioraw		Process development & optimization (USP & DSP)					✓		
	BIOSEARCH LIFE		Manufacture and Purification of plant extracts					✓		
	Leitat		Biotechnological cotton process					✓		
	Leitat	Monoclonal antibody	Generation, humanization, production, purification					✓		
	Lonza Biologics Porriño		Analytical services and stability studies of DS and DP					✓		
	BIOPOLIS	Bio-Rp	Production and purification of recombinant proteins					✓		
	BIOPOLIS	Bio-PHA	Process Development for PHA production					✓		

*Based on data provided by ASEBIO associated companies. JUNE 2017





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Spanish White Biotech Pipeline 2017

An overview of industrial biotechnology projects currently developed by the Spanish biotech industry

ASEBIO, the Spanish Bioindustry Association, encompasses over 270 firms, associations, foundations, universities, technology and research centers which carry out activities directly or indirectly related to biotechnology.

The wide number of associates makes **ASEBIO** the most appropriate meeting platform to face up the challenges of developing the biotechnology sector in Spain.

Around 630 companies research and develop products in the Spanish biotechnology sector.

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