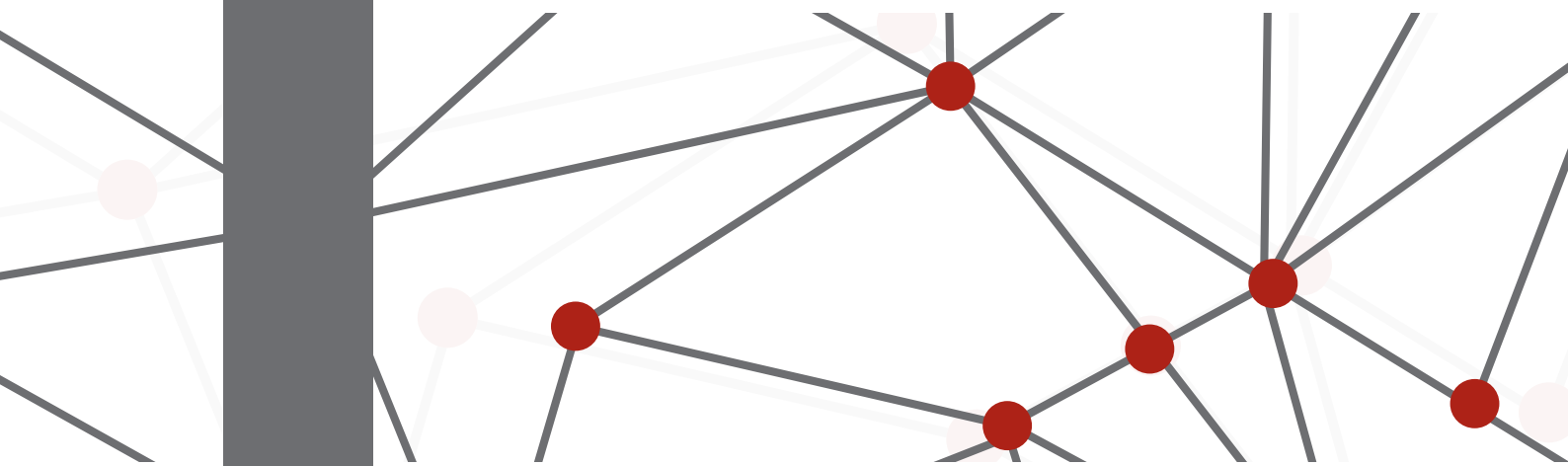




## **NANBIOSIS**

Infrastructure for the Production and Characterization of Nanomaterials, Biomaterials and Systems in Biomedicine





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## INTRODUCTION

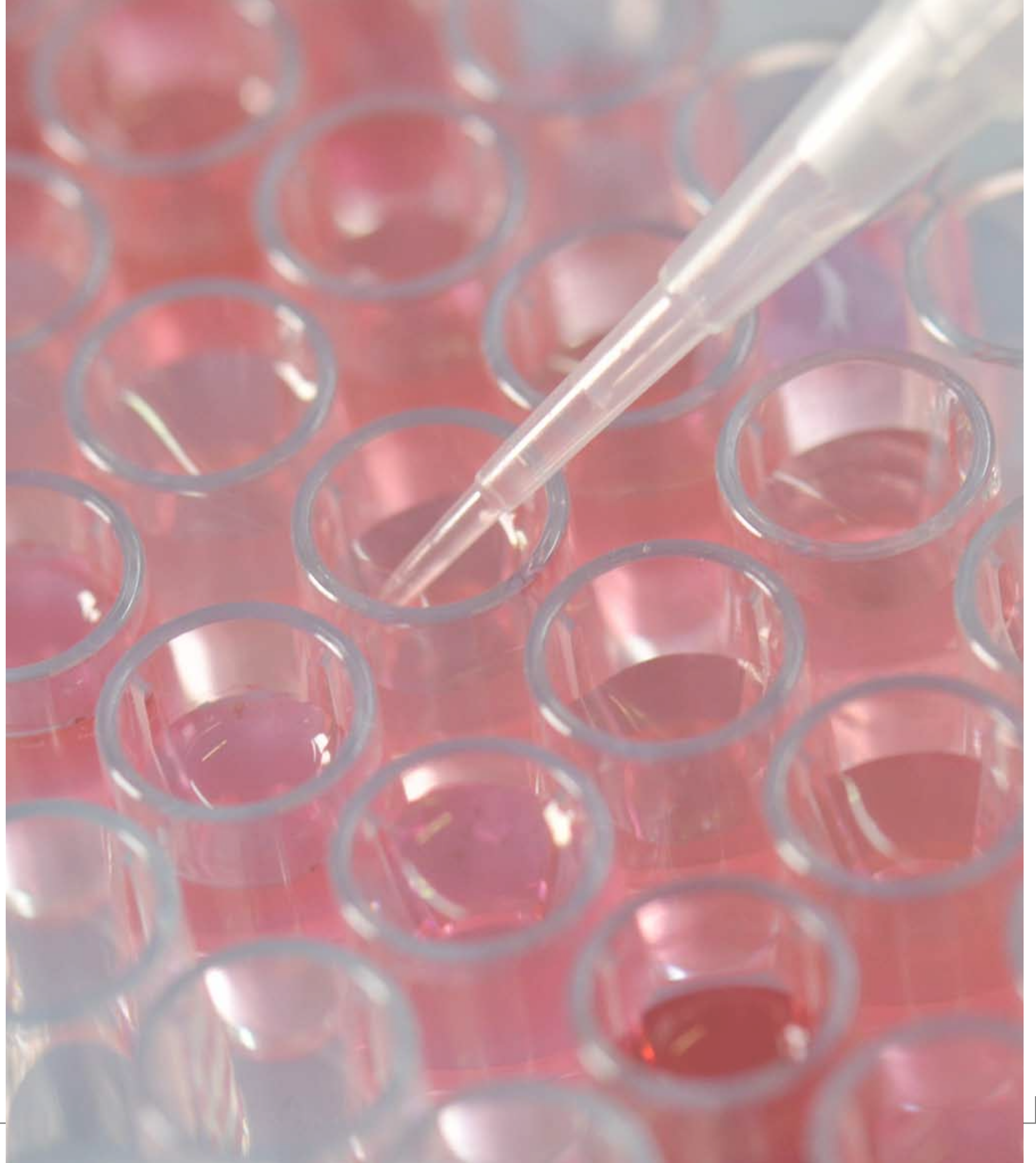
### NANBIOSIS

Infrastructure for the Production and Characterization of Nanomaterials, Biomaterials and Systems in Biomedicine

NANBIOSIS is one of the 29 existing Singular Scientific Technological Infrastructures (ICTS) recognized by the Spanish Government (<http://www.mineco.gob.es/portal/site/mineco/idi>). ICTS are large facilities, unique in their kind, that need high investments and are dedicated to frontier science.

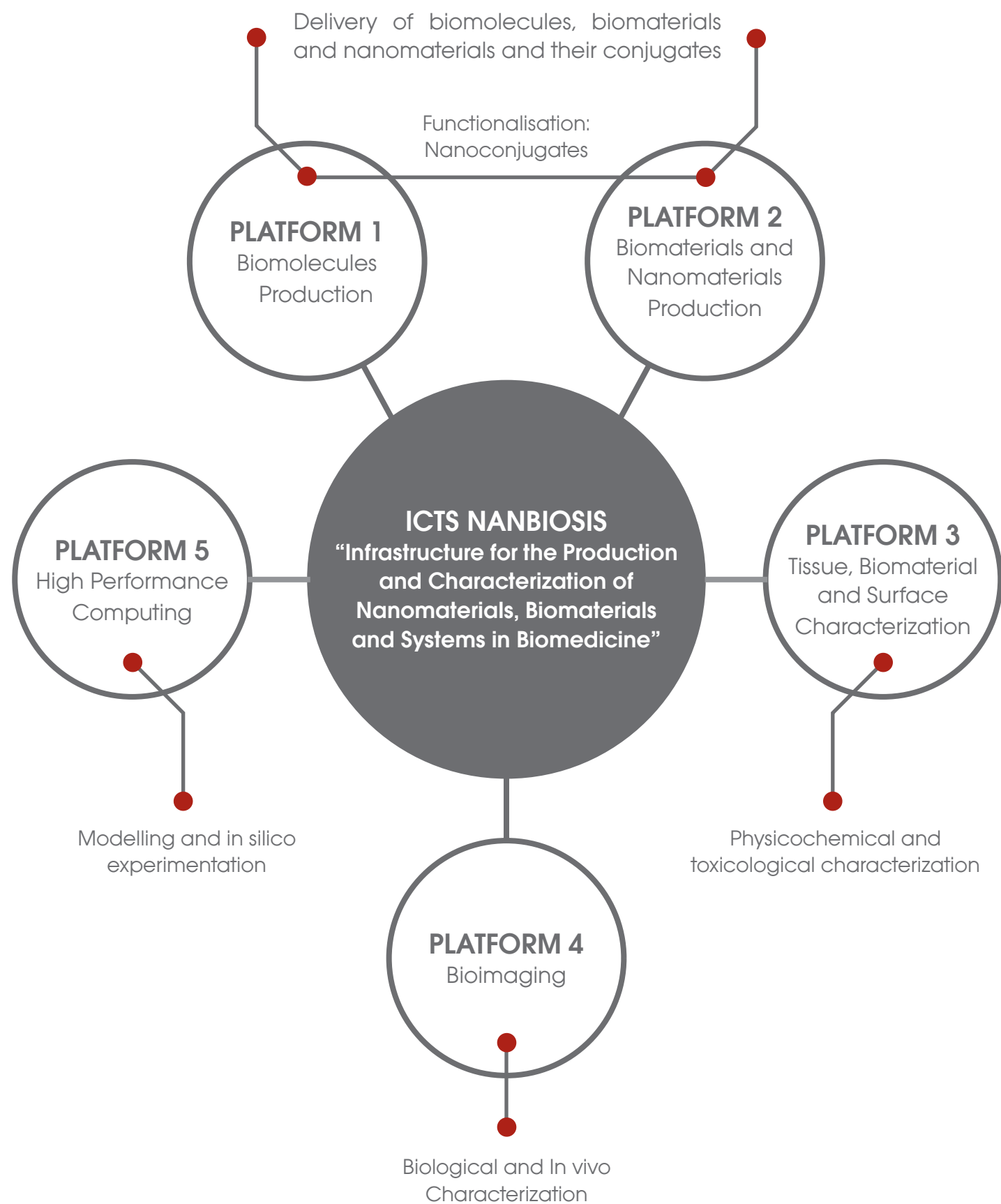
NANBIOSIS is an integrated approach of 27 coordinated units that has a cutting-edge scientific and technological infrastructure offering its services under a single contact point model. It is supported by some of the main Spanish research groups in bioengineering, biomaterials and nanomedicine.

NANBIOSIS provides a complete service that includes the design, the production of biomaterials and nanomaterials (conjugated or not) and the characterization of these bio and nanomaterials, tissues, medical devices and systems from a physical, chemical, functional, toxicological and biological point of view up to the complete preclinical validation, for different biomedical applications: IVDs, Biosensors, Regenerative Medicine, Drug Systems Delivery, Therapeutic Agents, MRI Contrast Agents, Medical Devices and Systems.



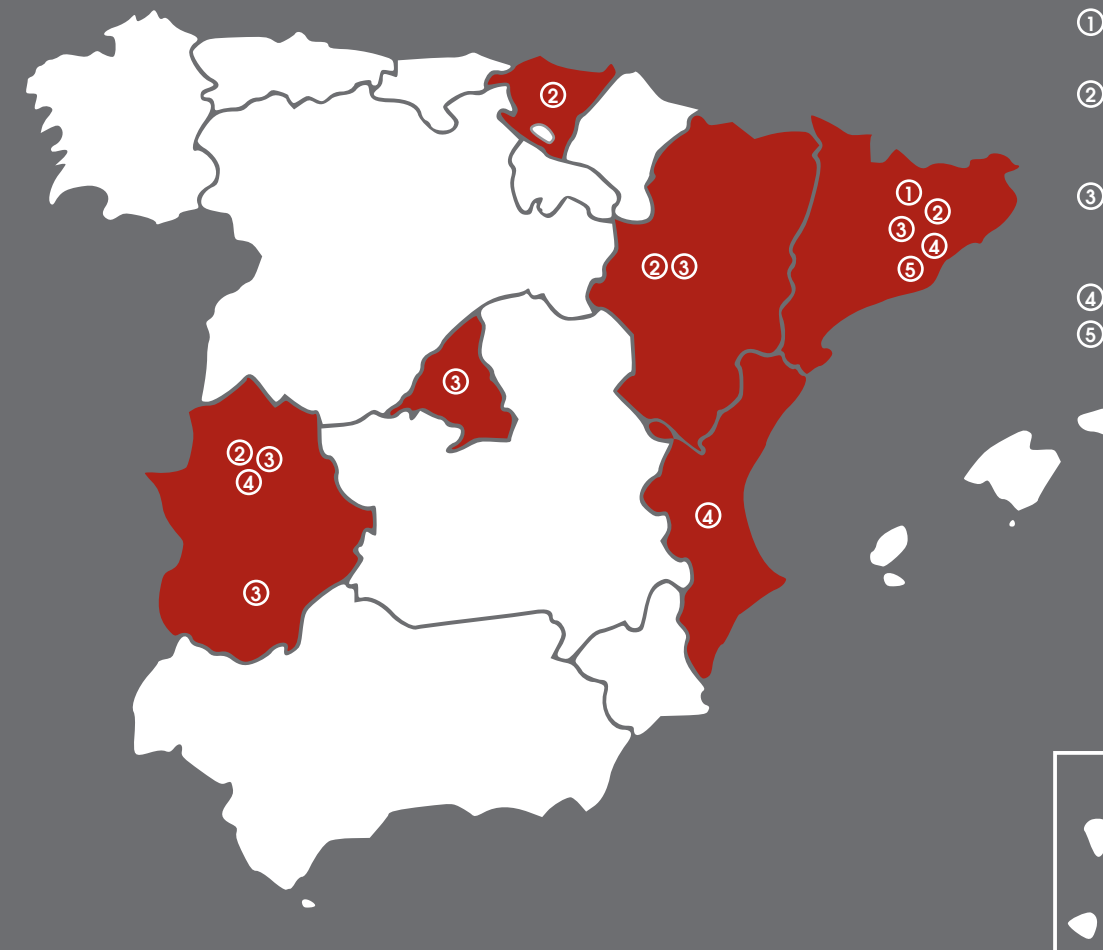
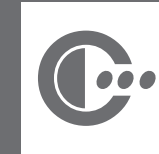


# ORGANIZATION CHART



# LOCATION

# OF THE UNITS OF NANBIOSIS



- ① **PLATFORM 1.** Biomolecules Production
- ② **PLATFORM 2.** Biomaterials and Nanomaterials Production
- ③ **PLATFORM 3.** Tissue, Biomaterial and Surface Characterization
- ④ **PLATFORM 4.** Bioimaging
- ⑤ **PLATFORM 5.** High Performance Computing

## CATALUNYA

- ① U1. Protein Production Platform (PPP)
- ① U2. Customized Antibody Service (CAbS)
- ① U3. Synthesis of Peptides
- ② U4. Biodeposition and Biodetection
- ② U5. Rapid Prototyping
- ② U6. Biomaterial Processing and Nanostructuring
- ② U7. Nanotechnology
- ② U8. Micro/Nanotechnology
- ③ U12. Nanostructured Liquid Characterization
- ③ U18. Nanotoxicology
- ④ U20. *In Vivo* Experimental Platform
- ④ U25. NMR: Biomedical Applications I
- ⑤ U27. High Performance Computing

## ZARAGOZA

- ② U9. Synthesis of Nanoparticles
- ③ U13. Tissue and Scaffold Characterization

## PAÍS VASCO

- ② U10. Drug Formulation

## EXTREMADURA

- ② U11. Pharmaceutical Lab
- ③ U14. Cell Therapy
- ③ U16. Surface Characterization and Calorimetry
- ③ U19. Clinical lab tests
- ④ U21. Operating Theatres
- ④ U22. Animal Housing
- ④ U23. Assisted Reproduction
- ④ U24. Medical Imaging

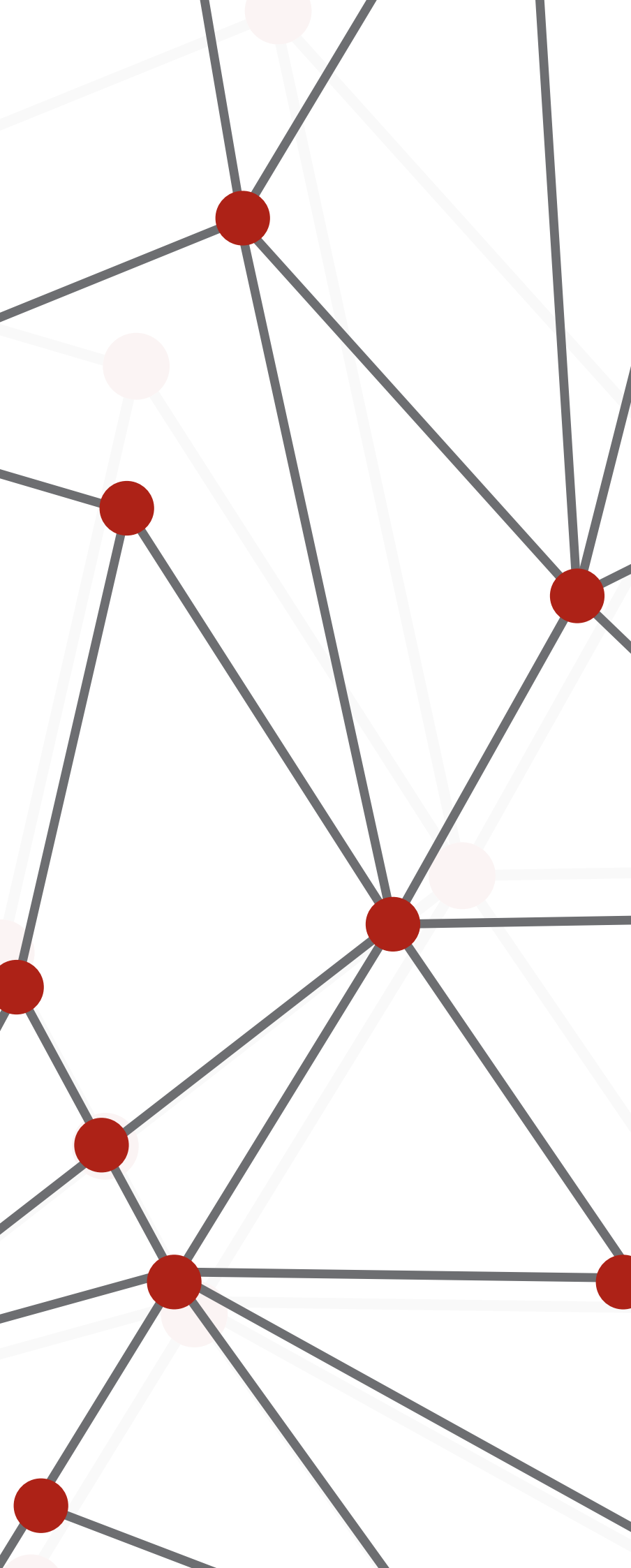
## MADRID

- ③ U15. Functional Characterization of Magnetic Nanoparticles
- ③ U17. Confocal Microscopy Service

## VALENCIA

- ④ U26. NMR: Biomedical Applications II





# PLATFORM 1

Biomolecules Production

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Universidad Autónoma de Barcelona (UAB)



# U1. Protein Production Platform (PPP)

## Services

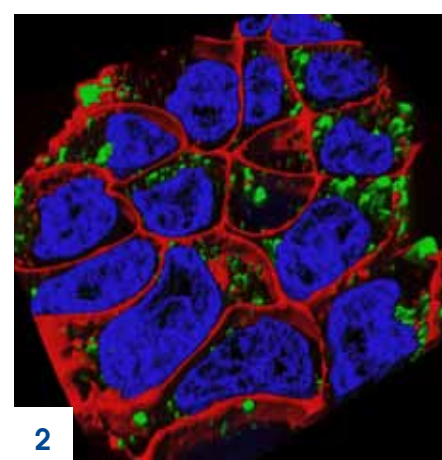
- U1-S1. Molecular cloning
- U1-S2. Bioproduction of proteins
- U1-S3. Proteins purification
- U1-S4. Consultancy in protein production
- U1-S5. Training courses in protein production
- U1-S6. Criopreservation

## Equipment

- 2 and 7 liter bioreactors for bio production
- 10 liter WAVE bioreactor for insect cells
- Incubator shaker with cooling unit for insect cell suspension cultures
- FPLC AKTA Chromatography systems for purification
- Tangential filtration unit for purification



1



2

1. Äkta Pure equipment for protein purification
2. 3D reconstruction of protein nanoparticles internalization in mammalian cells

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Consejo Superior de Investigaciones Científicas (CSIC)



# U2. Customized Antibody Service (CAbs)

## Services

- U2-S1. Scientific and technical support
- U2-S2. Rabbit Polyclonal Antibody Production
- U2-S3. Monoclonal Ab Production, Phase I: Mouse Immunization and ELISA Screening
- U2-S4. Monoclonal Ab Production, Phase II: Fusion and Screening
- U2-S5. Monoclonal Ab Production, Phase III: Cloning and Subcloning
- U2-S6. Monoclonal Ab Production, Phase IV: Expansion and Freezing
- U2-S7. Monoclonal Ab Production, Phase V: Antibody characterization
- U2-S8. In Vitro Monoclonal Ab Production in Cell Culture Dish
- U2-S9. In Vitro Monoclonal antibody Production in Bioreactor CL350 Integra
- U2-S10. Antibody Purification by Ammonium Sulfate Precipitation
- U2-S11. Affinity Antibody Purification
- U2-S12. Development of antibody fragments
- U2-S13. Testing of hybridomas for Mycoplasma
- U2-S14. Development of immunoassays
- U2-S15. Conjugation services
- U2-S16. Hapten synthesis

## Description

The facility is located in the Institute of Advanced Chemistry of Catalonia (IQAC-CSIC; Barcelona). It is equipped with a laboratory for the development and production of monoclonal antibodies. The laboratory is fully equipped for obtaining, selecting and storing monoclonal antibody producing hybridomas. In addition, the facility has infrastructure for the production of polyclonal antibodies, as well as laboratories for the synthesis of bioconjugates, haptens, the purification of antibodies and the performance of immunoassays. In addition to the above mentioned equipment, the IQAC-CSIC provides animal husbandry facilities and a unit for the synthesis of organic molecules.

## Equipment

The equipment consists in an inverted phase contrast microscope with a camera, two Class II laminar flow biological safety cabinets, two CO2 incubators, a bioreactor for hybridoma culture, and tangential filtration unit for purification of the antibodies produced in the culture. Among the items of available equipment it should be highlighted a spotter for selection of high antibody producing cell lines and an automated ELISA microplate washer an ELISA reader, two AKTA Prime Liquid chromatography systems for antibody purification, plus standard equipment (centrifuges, fridges, liquid nitrogen containers, autoclave, baths, and vacuum equipment) and all the necessary routine laboratory apparatus. Cabs also has access to a fully equipped chemistry laboratory for the synthesis of haptens and immunoreagents.



1



2

1. Hapten synthesis
2. Monoclonal antibody development

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Parc Científic de Barcelona (PCB) Universitat de Barcelona (UB)



## U3. Synthesis of Peptides Unit

### Services

U3-S1. Synthesis of peptides and characterisation

U3-S2. Modification of the peptides

### Description

This Unit is coordinated by the Peptides and Nanoparticles Group at the Parc Científic de Barcelona (PCB) and has the equipment necessary to provide services of synthesis of peptides at different scales (mg to g), purification, characterization, and post-synthesis modification, such as, conjugation to proteins and fluorescent. It counts with laboratories for synthesis and other to carry out modification of the peptides during and post synthesis labels. Also counts with a laboratory equipped with several preparative and analytical chromatography systems for purification and characterization.

This facility benefits from the wide experience of Dr. Fernando Albericio in the design and synthesis of peptides with specific biological activity and the introduction of modifications necessary for these peptides to be bound to therapeutic nanoconjugates and other molecules, either to take advantage of the pharmacological activity of the peptide itself or to facilitate the introduction of nanoconjugates or other molecules into the cells in order to reach the therapeutic target.

Its location allows the access to the rest of services of the PCB with an occupy area of 5.000m<sup>2</sup>.

### Equipment

- Automatic synthesizer
- High-performance liquid chromatography (HPLC ) systems with a diode array detector
- High-performance liquid chromatography (HPLC ) system with dual-wavelength UV detector
- High-performance liquid chromatography (HPLC -MS ) system with a diode array detector and coupled to a mass spectrometer
- Bohdan miniblocks
- Lyophilizers and SpeedVac evaporators
- System for acidolactic cleavage (Boc/Bzl strategy), UNIQUE IN SPAIN

In addition, this unit has access to:

- Amino acid analyzer and MALDI -TOF for characterization
- Microwave peptide synthesizer



1

1-2. Analytical high-performance liquid chromatography (HPLCMS) system with a diode array detector and coupled to a mass spectrometer



2



# PLATFORM 2

Biomaterials and Nanomaterials Production



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Research Center on Nanoscience and Nanotechnology CIN2, CSIC



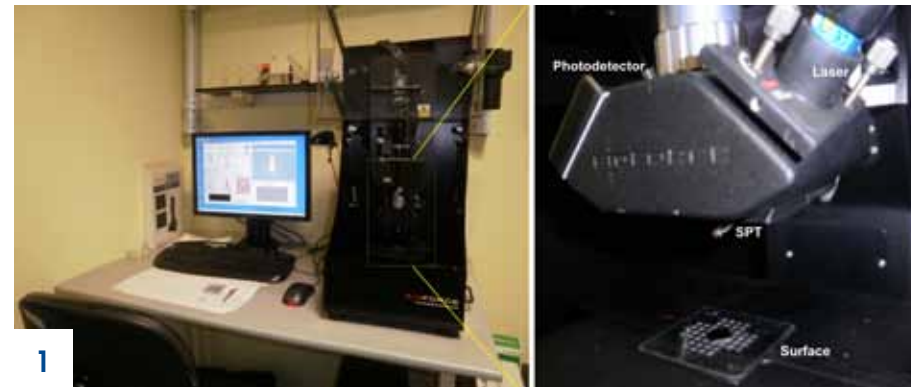
## U4. Biodeposition and Biodetection Unit

### Services

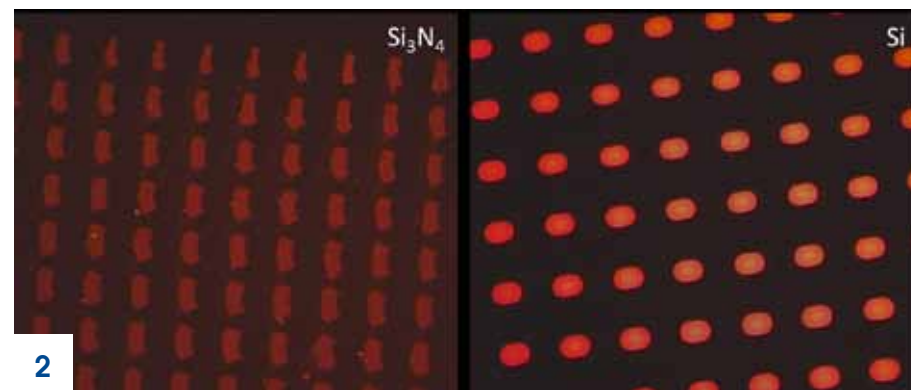
- U4-S1. Biodeposition by Nanoenabler
- U4-S2. Biodetection by SPR

### Equipment

- Nano enabler™ System (Unique System available in Spain)
- Surface Plasmon Resonance (SPR) (Sensia B-SPR).



1



2

- Biodeposition Unit
- Spotted deposition of fluorescent protein over chemically treated  $\text{Si}_3\text{N}_4$  and Si surfaces

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Biomaterials for Regenerative Therapies Group  
Institutos de Bioingeniería de Cataluña (IBEC)



## U5. Rapid Prototyping Unit

### Services

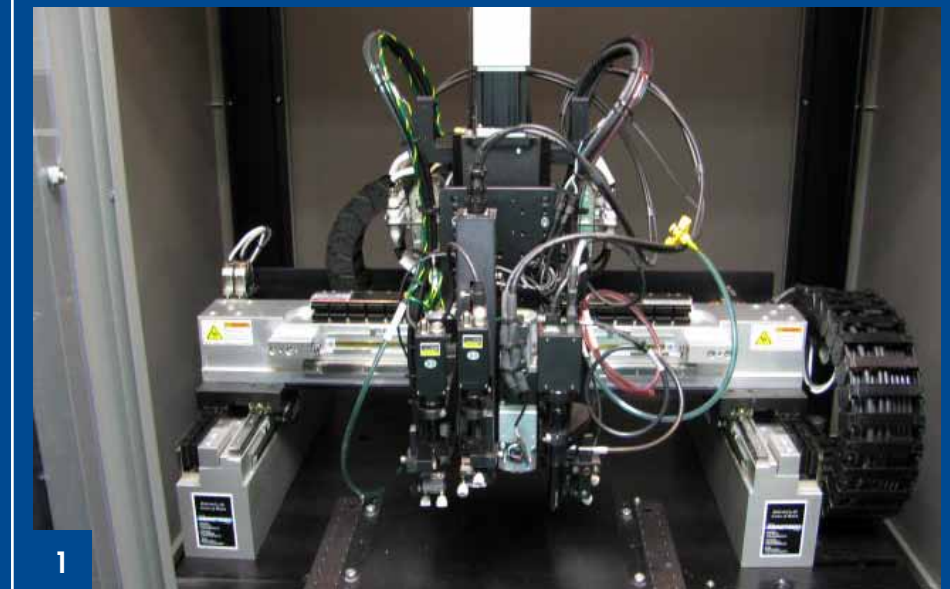
- U2-S1. Fabrication of 3D porous scaffolds by Rapid Prototyping

### Description

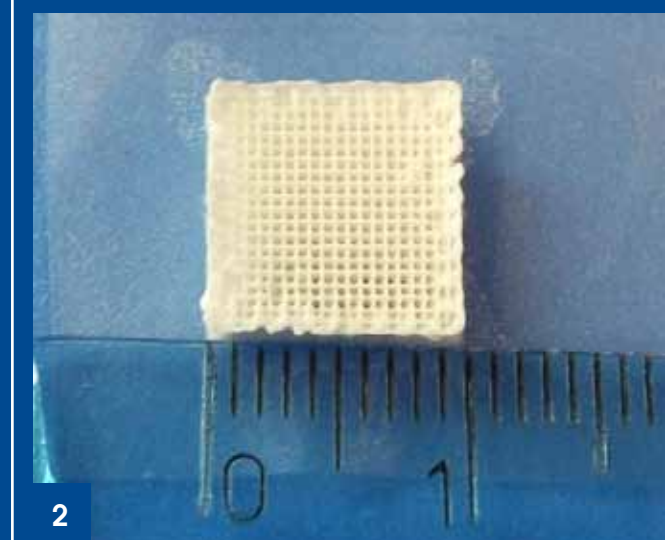
This facility is headed by Dr. Elisabeth Engel, PI of the Biomaterials for Regenerative Therapies Group at the Institute for Bioengineering of Catalonia (IBEC) and counts with a laboratory equipped to produce 3D structures of different materials. This system allows the fabrication of 3D porous scaffolds of defined geometry and porosity for tissue engineering applications. Dispensing and locating cells in specific positions on defined substrates is also possible due to the high precision levels of this tool.

### Equipment

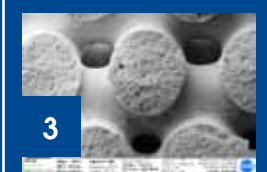
Tissue Engineering Tool 3D-300 series (nScript Inc.) for rapid prototyping.



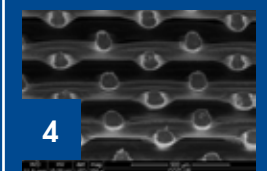
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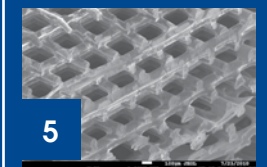
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- Biotool
- Poly(lactic acid) (PLA)/Poly(ethylene glycol) (PEG)/CaP glass 3D biodegradable porous scaffold for tissue engineering applications
- Ceramic scaffold
- Poly(lactic acid) (PLA)
- Poly(lactic acid) / Poly(ethylene glycol) (PLA-PEG)



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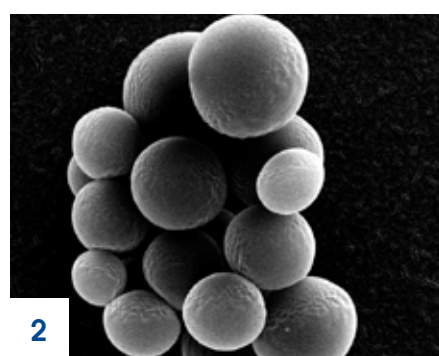
## U6. Biomaterial Processing and Nanostructuring Unit

### Services

- U6-S1. Use of High-pressure laboratory-scale plant with 50, 100 and 300 ml reactors for the processing of biomaterials
- U6-S2. High-pressure phase analysis
- U6-S3. Thermal analysis of solid materials
- U6-S4. Analysis of particle size
- U6-S5. Analysis of shape distributions
- U6-S6. Fluorescence spectroscopic analysis
- U6-S7. UV-Vis spectroscopic analysis
- U6-S8. Visual observation
- U6-S9. Centrifugation
- U6-S10. Treatment of sample by ultrasound probe
- U6-S11. Helium pycnometry
- U6-S12. Packed (tapped) density

### Equipment

- High-pressure laboratory-scale plant with 50, 100 and 300 ml reactors for the processing of biomaterials
- High-pressure phase analyzer for studying the thermodynamic behaviour of materials
- Malvern Zetasizer Nano ZS particle size analyzer
- Nanosight LM -20 particle size analyzer
- Perkin-Elmer DSC 8500 differential scanning calorimeter
- Olympus BX51 optical microscope with heating plate and fluorescence accessories
- Perkin-Elmer LS 45 fluorescence spectrometer
- Varian Cary 5 UV -Vis spectrometer
- Quantachrome Ultrapyc 1200e helium pycnometer
- Ultrasound probe and Autotap instrument for packed density measurements of powders
- Malvern Morphologi G3 for advanced particle morphology characterization
- Microcalorimeter for measurements under Isothermal Titration Calorimetry (ITC)
- Four Glove Dispensing isolator for experiments with highly active and cytotoxic compounds



1. Compressed fluids based biomaterials processing platform  
 2. Particle design for drug delivery

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Plataforma de Nanotecnología



### Description

The Nanotechnology Platform is part of the institute's long-term strategic plan to create new Core Facilities in nanofabrication and bionanocharacterization. Currently, the platform is an accessible and versatile research facility featuring 150m<sup>2</sup> of class 10,000 cleanroom space and laboratories offering state-of-the-art equipment for the fabrication and characterization of micro- and nanodevices and structures. Our aim is to facilitate advanced research by providing services in the fields of nanoscience and nanotechnology for all academic and industrial researchers. Some of the many areas of application include nanobioengineering, BioMEMS, materials science, tissue engineering, optic and biomaterials. IBEC's Nanotechnology Platform offers scientific and technological support that includes the design, development and analysis of devices, materials, and processes, so that academic researchers and companies alike may use the platform to develop their innovative ideas.

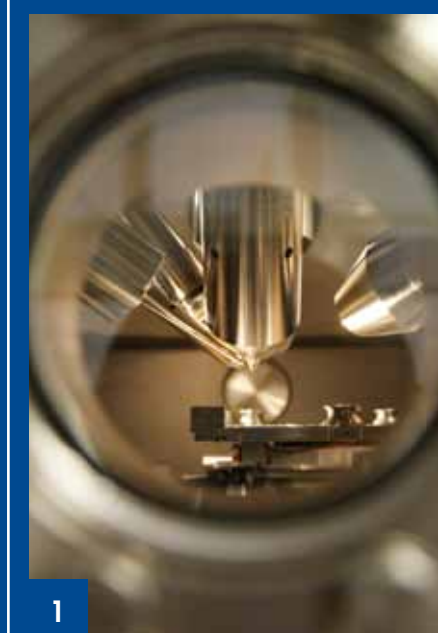
## U7. Nanotechnology Unit

### Services

- U7-S1. Training Courses in the Use of nanotechnology equipment
- U7-S2. Characterization by ToF-SIM
- U7-S3. Characterization by SEM
- U7-S4. Lytography by e-beam
- U7-S5. HEL – Hot Embossing Lithography
- U7-S6. NIL – Nanoimprint Lithography
- U7-S7. Photolithography and soft-lithography manufacturing processes
- U7-S8. Fabrication of Chromium masks
- U7-S9. Metal deposition
- U7-S10. Advising and consulting in micro and nanofabrication

### Equipment

- Ebeam/SEM (Nova NanoSEM 230/Raith)
- ToF-SIMS (Time of the Flight Secondary Ion Mass Spectroscopy)
- HEL – Hot Embossing Lithography
- NIL – Nanoimprint Lithography
- UV optical Lithography (Mask Aligner)
- Laser Lithography (Mask Plotter)
- RIE – Reactive Ion Etching
- Wet Etching
- Thermal and e-beam metal evaporator
- Spin-coater
- Plasma Clenaer
- Interferometer
- Profilometer
- Optical Microscopy
- Oven
- UV Curing Lamp System
- Microarrayer SPOTBOT2
- Contact Angle (OCA15 plus)



1. Time-of-Flight Ion Mass Spectroscopy  
 2. Using photolithography to fabricate microfluidic devices



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## U8. Micro/Nanotechnology Unit

### Services

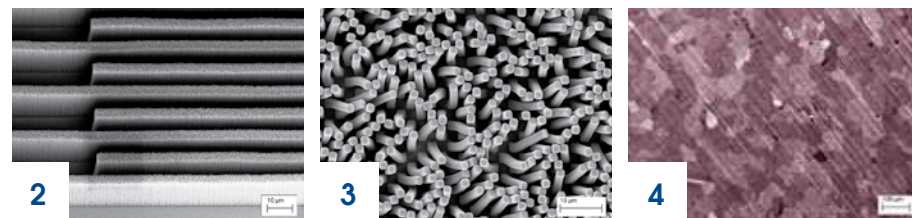
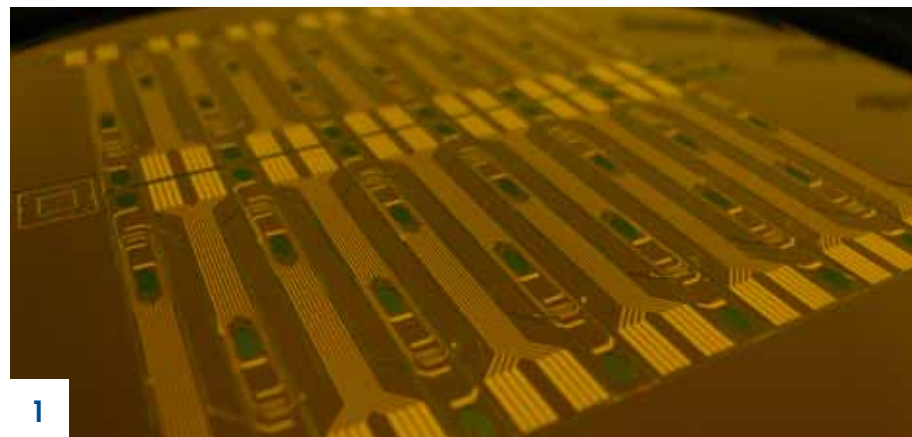
- U8-S1. Design, fabrication and encapsulation of microelectrodes (based on gold or platinum) on different rigid (Si, SiC or Pyrex) or flexible polymeric substrates**
- U8-S2. Electrochemical and electrical characterization of the above mentioned microelectrodes**
- U8-S3. Carbon nanotubes and Graphene growth by Chemical Vapor Deposition technique**

### Equipment

Chemical vapor deposition (CVD) equipment for growth of CNTs, Black Magic Pro 4-inch System (AIXTRON Ltd).

Furthermore, in the clean room (1500 m<sup>2</sup>, Classes 10 to 10,000) in which this equipment is located there is:

- Thermal oxidation process equipment
- Platinum and gold deposition equipment
- Optical photolithography equipment
- CVD nitride and oxide passivation equipment
- Chemical banks for micro/nanotechnologies
- RIE and DRIE equipment
- Nanolithography equipment
- Optical (SEM) and electrical (Impedance) characterization equipment
- Encapsulation equipment



- 1. Fabrication at wafer level of final SU-8 flexible devices for corneal assessment**
- 2. Aligned Carbon Nanotubes grown on Pt substrate on the area of an interdigitated electrode**
- 3. Top view aligned Carbon Nanotubes grown on Pt substrate on the area of an interdigitated electrode**
- 4. CVD graphene grown on copper foil**

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Institute of Nanoscience of Aragón (INA)  
 Universidad de Zaragoza



### Description

This unit, integrated in the Nanostructured Films and Particles Group at the Institute of Nanoscience of Aragón (INA) coordinated by Dr. Jesús Santamaría, has as objective the synthesis of nanoparticles with applications in biomedicine. The unit provides an automated system for the synthesis of nanoparticles using laser-induced pyrolysis of chemical precursors in gas and/or aerosol phase, which enable either individual nanoparticles or biocompatible hybrid nanostructures to be produced in large quantities. In addition, this facility is able to draw on a wide range of nanoparticles fabrication technique, as well as having the necessary specialized personnel, to undertake exhaustive characterization of the microstructure, chemical composition, particles size and distribution of sizes, as well as magnetic, optical and colloidal properties and degree of biological functionality of the synthesized material.

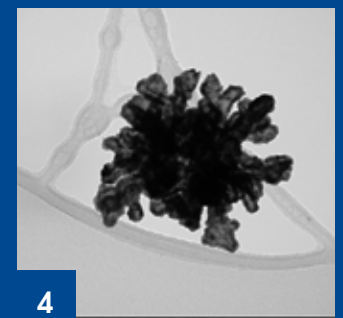
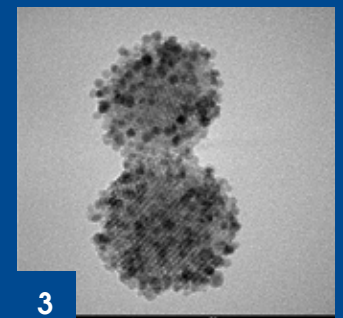
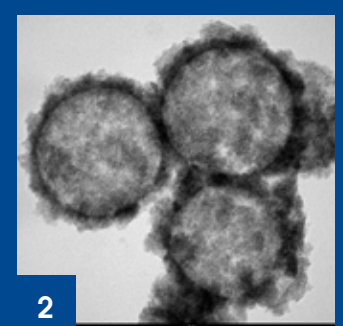
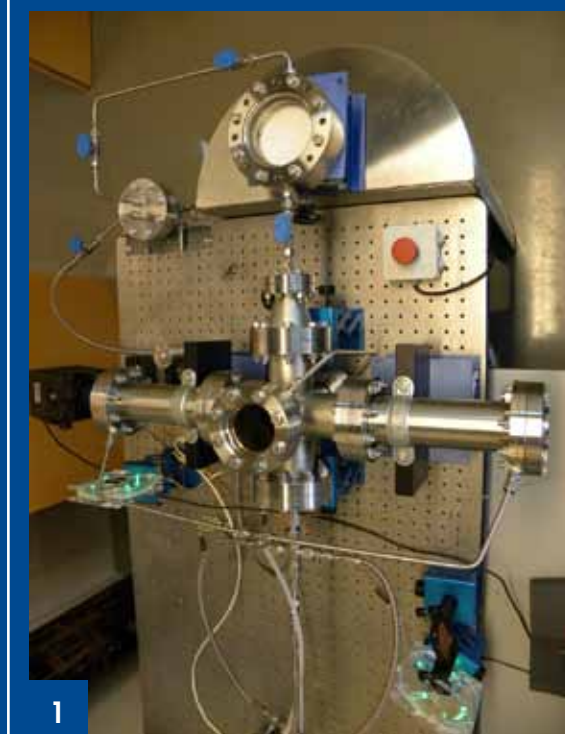
## U9. Synthesis of Nanoparticles

### Services

- U9-S1. Synthesis of NPs by laser induced-pyrolysis**
- U9-S2. Synthesis of Nps by wet methods and microfluidic technology**
- U9-S3. Characterization of nanoparticles**
- U9-S4. Drug delivery determination**
- U9-S5. Consultancy**

### Equipment

- Laser-induced pyrolysis technology
- Microfluidic Technology
- Hydrothermal synthesis systems
- Microwave-induced synthesis
- Synthesis reactors using non hydrolytic decomposition of organometallic and inorganic precursors at high temperature



- 1. Laser pyrolysis device**
- 2. Hollow magnetic nanoparticles**
- 3. Magnetic mesoporous silica hybrid nanoparticles**
- 4. Plasmonic nanoparticles**

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# U10. Drug Formulation

## Services

- U10-S1. Design & Development of pharmaceutical forms
- U10-S2. Design & Development of micro- & nanocapsules
- U10-S3. Design & Development of solid lipid nanoparticles (SLN)
- U10-S4. Design & Development of living cells containing microparticles
- U10-S5. Biopharmaceutical evaluation of dosage forms
- U10-S6. Setup and validation of analytical techniques
- U10-S7. Pharmacokinetic pre-clinical and clinical studies

## Equipment

- Cell Culture Laboratory
- Flow cytometer
- Dropper electrostatic
- Autoclave
- Fluorescence inverted microscope imaging system
- Inverted microscope with imaging system
- System for processing micro and nanoparticles by atomization
- Spray-dryer
- High pressure homogenizer
- Freezedryer
- Particle size analyzer in solid
- Coulter Particle size analyzer
- Particle size analyzer and Zetasizer
- Compression Tablet machines (eccentric and rotary)
- Fluid Bed
- Coating machines
- Capsules machine
- Blister packing machine
- One step mixer Granulator
- Liquid chromatograph with fluorescence detection
- Liquid chromatographs with UV detection
- Liquid chromatograph with electrochemical detection
- HPLC-MS
- HPLC-MS/MS
- UPLC
- GC-MS, GC-NPD
- Dissolution test Equipment
- Desintegration tester
- Friabilometer
- Durometer
- Determination of moisture equipment
- Viscometer
- - 80° C Freezers
- Climate chambers with temperature and humidity control



1



2

1. Dissolution rate determination equipment
2. SprayDryer

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Jesus Usón Minimally Invasive Surgery Centre (JUMISC)



# U11. Pharmaceutical Lab

## Services

- U11-S1. Preparation and dispensing of dosage forms for Pharmacokinetic pre-clinical studies

## Equipment

- Precision balance
- PH-meter
- Magnetic stirrer
- TI LAZO Temperature IKA TC 3 (YELLOW LINE)
- Rotary shaker
- PGW Balance (ADAM)
- Logger Temperature
- Thermohygrometer
- Freezer 2-8° C

## Description

The pharmaceutical laboratory is enabled and equipped to store, formulate and reconstitute trial products for different *in vivo* preclinical studies carried out by Nanbiosis with strict ISO 9001 quality standards and Good Laboratory Practice (GLP).



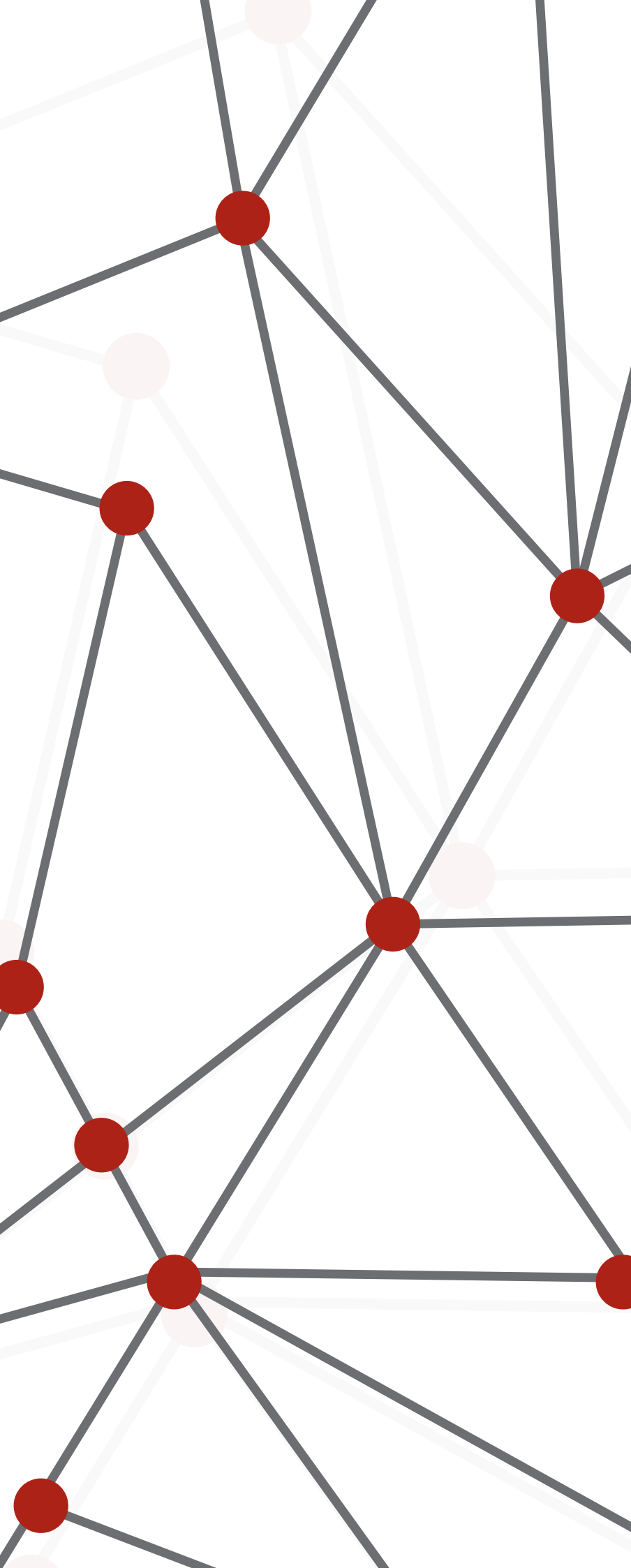
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1. Pharmaceutical Compounding Laboratory
2. Weight devices in the lab





# PLATFORM 3

Tissue, Biomaterial and Surface Characterization

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Colloidal and Interfacial Chemistry Group (QCI) at the Institute of Advanced Chemistry of Catalonia (IQAC) & Consejo Superior de Investigaciones Científicas (CSIC)



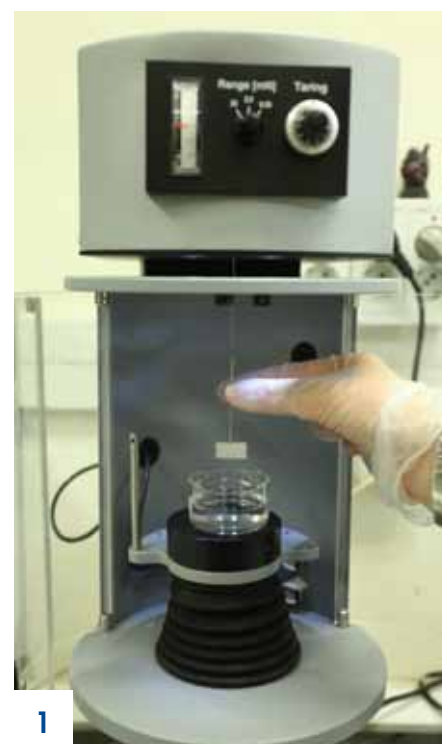
## U12. Nanostructured Liquid Characterization

### Services

- U12-S1. Characterization of colloidal dispersions by Dynamic and Static Light Scattering (DLS and SLS)
- U12-S2. Characterization of liquid crystals
- U12-S3. Phase behavior of surfactant systems
- U12-S4. Rheology
- U12-S5. Surface and interfacial tensiometry
- U12-S6. Contact angle
- U12-S7. Differential refractometry
- U12-S8. Characterization of nanostructured materials by high resolution optical microscopy with spectral analysis

### Equipment

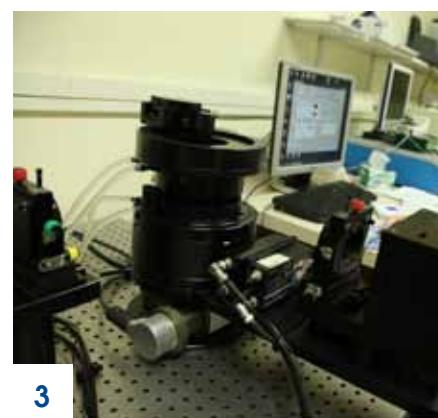
- 3D cross-correlation DLS Spectrometer
- AR-G2 Rheometer
- Malvern 4700 Spectrometer
- Mastersizer 2000 Light Diffractometer
- S3 Micro SAXS/WAXS Small and Wide Angle X-Ray Spectrometer
- SITE Spinning Drop Interfacial Tensiometer
- K12 tensiometer
- Sigma 700 surface tensiometer
- Optilab rEX Differential Refractometer
- DMA -46 densitometer
- BX51TRF6 Olympus Optical Microscope
- Turbiscan Lab
- Avanti J30I ultracentrifuge
- CytoViva Hyperspectral Imaging System (HSI)



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1. Tensiometer
2. Enhanced darkfield optical microscopy with high resolution hyperspectral imaging (CytoViva)
3. 3D cross-correlation DLS Spectrometer for static & dynamic light scattering

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## U13. Tissue and Scaffold Characterization

### Services

- U13-S1. MicroCT
- U13-S2. Axial-Torsional TENSILE TEST INSTRON 8874
- U13-S3. FATIGUE TESTS INSTRON 8874
- U13-S4. DYNAMIC MECHANICAL ANALYSIS INSTRON 8874
- U13-S5. UNIAXIAL TENSILE TEST INSTRON MicroTester
- U13-S6. CONFINED COMPRESSION TEST INSTRON MicroTester
- U13-S7. UNIAXIAL TENSILE NANO BIONIX MTS

### Description

This platform is coordinated by Dr. E. Peña member of the Applied Mechanics and Bioengineering Group of the Aragón Institute of Engineering Research (I3A) at the University of Zaragoza. The objective of this unit is to provide services for structural and physical characterization of biological tissues and tissue scaffolding, including microstructure, histology and mechanical tests among others. This platform, unique in Spain as regarding its capability, has a clear and direct translational impact, especially in regenerative medicine, implant design and evaluation, as well as in the study of the mechanical behavior of living tissues (especially in the musculoskeletal and cardiovascular systems). Its relationship with the Instituto Aragonés de Ciencias de la Salud (Health Sciences Institute of Aragon), and through it with the Tissue and Blood Bank of Aragon and with the School of Veterinary Science at the Universidad de Zaragoza, allows an easy provision of tissues both from animals (mice, rabbit, sheep, pig) and humans, following in their handling the recommendations of the different ethics committees.

### Equipment

- MicroCT GE eXplore Locus SP (GE)
- Machines for mechanical tests:
- Instron MicroTester 5848 and 5548
  - Biaxial Instron MicroTester 8874
  - E1000 Test Instrument: Dynamic systems
  - Nano BIONIX MTS



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1. MicroTester INSTRON 5548
2. MicroCT GE eXplore Locus SP

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(JUMISC)



## U14. Cell Therapy

### Services

- U14-S1. Cell cultures
- U14-S2. Flow Cytometry

### Equipment

- Cell culture rooms:
- Laminar flow cabinet
  - CO<sup>2</sup> incubator
  - Inverted microscope
  - Vacuum pump
  - Cell culture water bath
  - Cell counter



- 1. Stem cell core facility
- 2. Flow cytometry equipment for stem cells research

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Centre for Biomedical Technology (CTB)  
Universidad Politécnica de Madrid (UPM)



### Description

This facility is coordinated by Dr. José Javier Serrano and Dr. Francisco del Pozo, PI of the Biomedical Engineering and Telemedicine Centre at the Centre for Biomedical Technology (CTB), Technical University of Madrid (UPM). The set-up is dedicated to the characterization of the magnetic and mechanical behavior of magnetic nanoparticles at temperatures and other environmental conditions compatible with physiological conditions. It is already possible to characterize magnetic materials (e.g., magnetic nanoparticles) in terms of their magnetic moment under applied external magnetic fields.

- 1. Alternating Gradient Field Magnetometer (AGFM)
- 2. Fast Field Cycling NMR Relaxometry (FFCNMR Relaxometry)

## U15. Functional Characterization of Magnetic Nanoparticles

### Services

- U15-S1. Magnetometry
- U15-S2. Relaxometry

### Equipment

- Alternating Gradient Magnetometer
- T1 and T2 Nuclear Magnetic Resonance Relaxometry





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Universidad de Extremadura (UEX)



# U16. Surface Characterization and Calorimetry

## Services

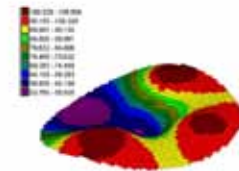
- U16-S1. XPS
- U16-S2. Ellipsometry
- U16-S3. Calorimetry
- U16-S4. ToF-SIMS

## Equipment

- TAM III isothermal nanocalorimeter system (TA Instruments)
- UVISEL ellipsometer (Horiba JovinYvon)
- K-Alpha X-ray photoelectron spectroscopy (XPS) system (Thermo)
- ToF-SIMS 5 Time-of-flight secondary-ion mass spectrometry system (ION TOF)



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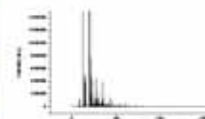


Mapping of a surface layer thickness obtained by ellipsometry

1. Ellipsometry
2. ToF-SIMS



2



ToF-SIMS spectra and mapping of several ions on surface

## Description

This platform is coordinated by Dr. M. Luisa González, PI of the Microbial Adhesion Research Group at the University of Extremadura. The purpose of this unit is to give support for the analysis of surface composition to researchers. This facility allows a broad knowledge about the chemistry of surfaces by the combination of the information of elements presents and their coordination state, given by the XPS technique, and the molecular structure of surface provided by the ToF-SIMS equipment. Its capabilities permit to work with extended and powdered solids, including those from biological origin as cells and bacteria. The characteristics of thin films on surfaces, as thickness, composition or electrical conductivity, can be also analyzed in this unit by spectroscopic ellipsometry. In addition, calorimetric analysis can be performed to test surface reactivity on powdered solids. ITC calorimetry facility is also under the Unit scheme.

Surface analysis laboratory fulfils the ISO9001:2008 (ES050823-1).

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Facultad de Medicina Universidad de Alcalá de Henares (UAH)



## Description

Located in the Cell Culture Unit, Faculty of Medicine, University of Alcalá, has a room perfectly suited to host a Confocal Microscope service that provides 4 lasers and cell incubation cabin. This Unit is coordinated by Dr. Juan Manuel Bellón, PI of the Translational Research and Tissue Engineering Group at the University of Alcalá.

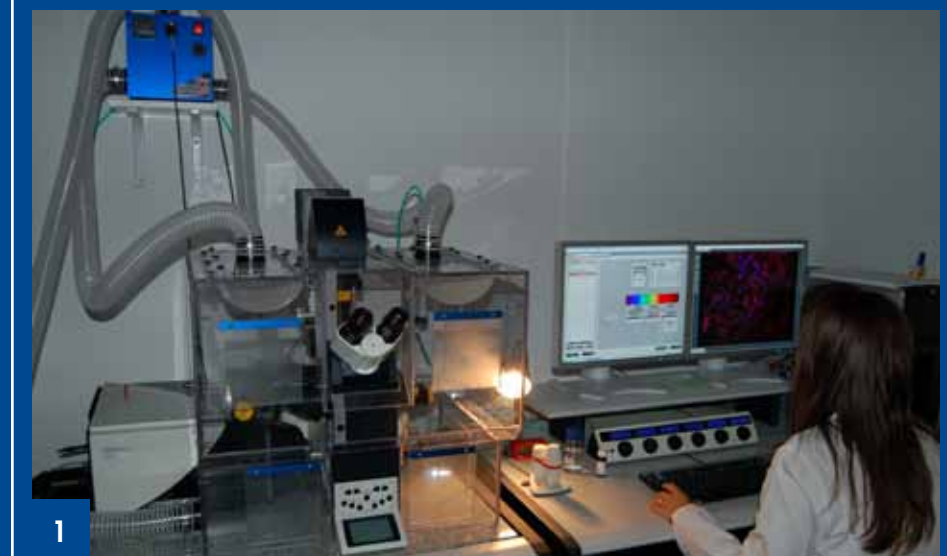
# U17. Confocal Microscopy Service

## Services

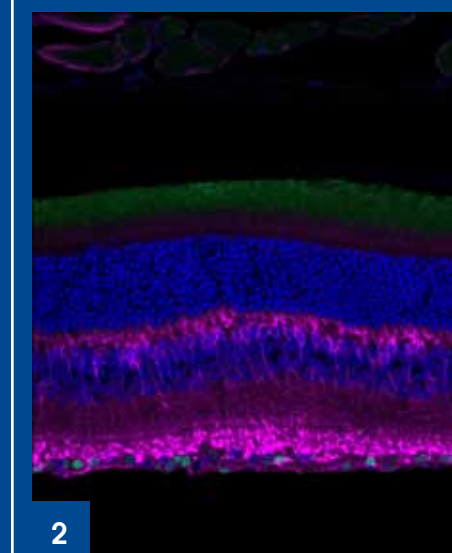
U17-S1. Confocal Microscopy Service

## Equipment

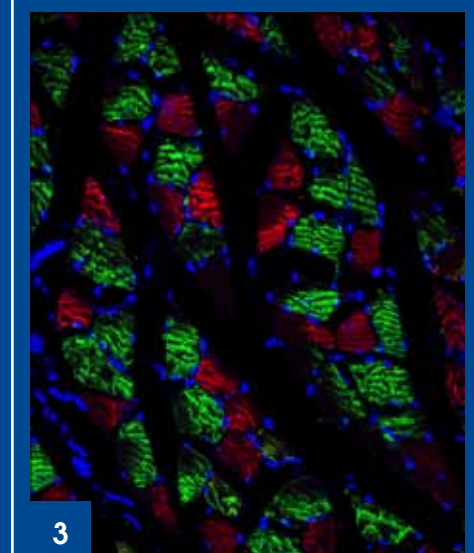
- Leica TCS-SP5 confocal microscope



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1. Image of the Confocal Microscopy Service
2. Immunohistochemical labeling of the mouse retina
3. Immunohistochemical staining of the anterior tibial muscle of mouse



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Hospital de la Santa Creu i Sant Pau Institut de Recerca de L'Hospital Universitari Vall D'Hebron

# U18. Nanotoxicology

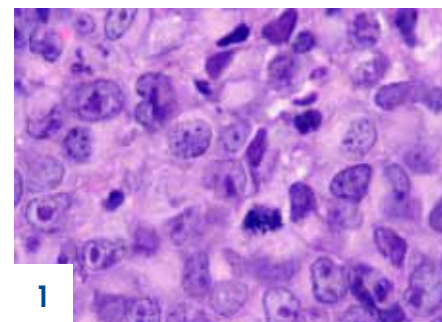
## Services

U18-S1. *IN VITRO* NANOTOXICOLOGY

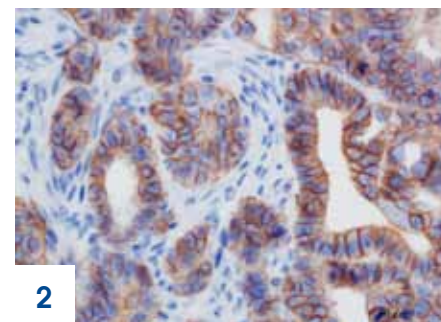
U18-S2. *IN VIVO* NANOTOXICOLOGY, preclinical histopathology in animal models

## Equipment

- Cell culture rooms
- Autoclaves, refrigerators, freezers and liquid nitrogen tanks
- Dissection hoods
- Equipment for paraffin processing
- Equipment for cutting and staining histological sections
- Dako AS10030 immunostainer
- Tip and bath sonicators
- Plate readers
- Electrophoresis systems



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## Description

This Unit is located in the Hospital de la Santa Creu i Sant Pau, in Barcelona, and is coordinated by Dr. Ramón Mangues, PI of the Oncogenesis and Antitumor Drug Group.

The main objective of the Nanotoxicology Unit is to assess the toxicity of new drugs, nanoparticles or nanotechnology based biomaterials *in vitro* and *in vivo* systems, with the goal of optimizing lead compounds and identifying those with the highest probability of success in the preclinical programme due to their greater safety and tolerability or reduced toxicity. It has rooms equipped for cell culture, for cryopreservation of samples and cell lines, and for sample preparation and analysis and animal facilities for *in vivo* experimentation.

1. Histopathology analysis-HE staining x1000 magnification tumor cells growing
2. Histopathology analysis-membrane receptor immunohistochemistry
3. Animal facility-SPF conditions for in vivo experiments

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Jesus Usón Minimally Invasive Surgery Centre (JUMISC)



## Description

The clinical analysis laboratory performs a wide variety of analysis, including: biochemistry, hematology, coagulation, urinalysis, blood gases analysis, different biomarkers,... in various animal species (rat, mouse, rabbit, pig, sheep, dog, cat). All types of blood, urine and other body fluids tests can be analysed. The laboratory is certified with ISO-9001 and Good laboratory practices (GLP), these strict quality standards allow the production of high accuracy results. Species specific methodologies are used in each animal species according to their physiological and pathological identity.

1. Clinical analysis laboratory
2. Cardiac enzyme analysis

# U19. Clinical tests lab

## Services

U19-S1. Preclinical *in vivo* toxicology

## Equipment

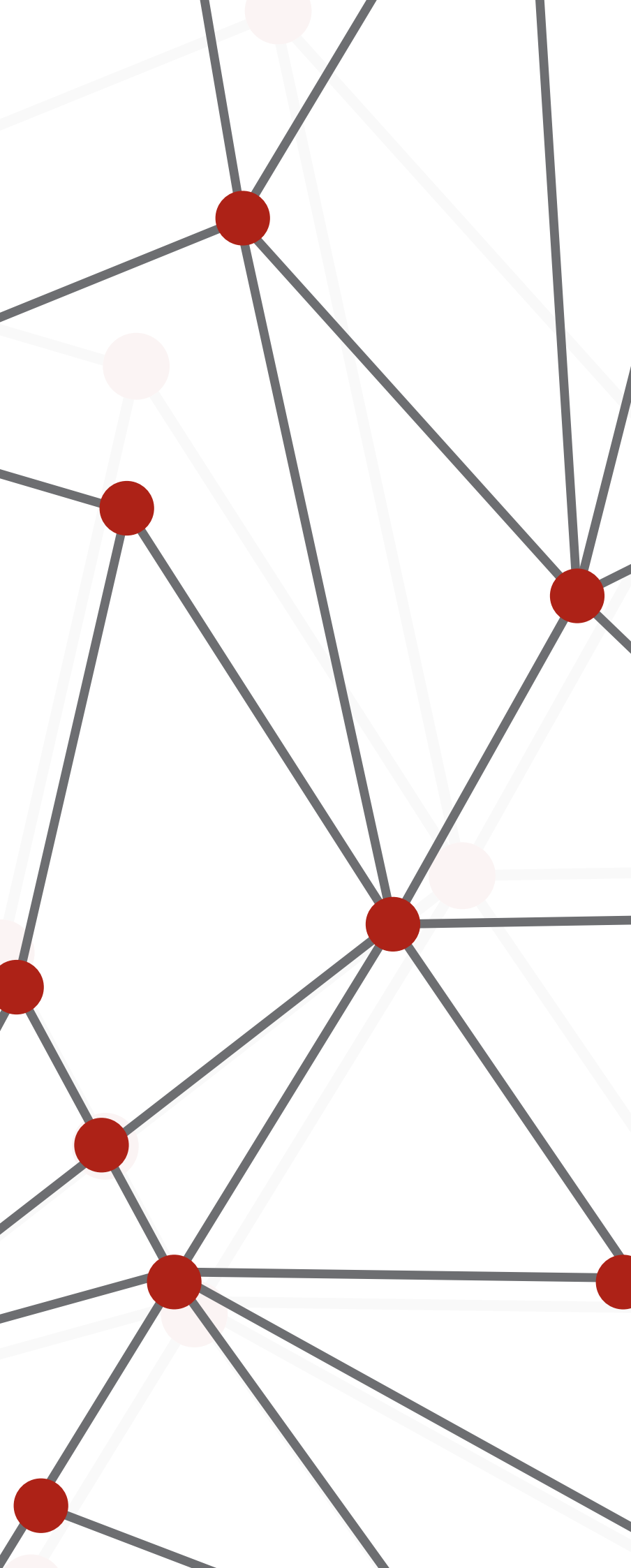
- Automatic coagulometer
- Clinical Autoanalyzer
- Hematology Analyzer/cell counter
- AQT90 FLEX Analyzer
- Water purification system
- Refrigerated cabinet
- Upright freezer
- Digital automatic micropipettes
- Centrifuge SELECTA
- Rotary shaker
- Recorder Device leukocyte
- Binocular microscope
- pH Meter
- Analyzer gasometer
- i-STAT® 1 Analyzer
- Auto Hematology analyzer
- Refrigerator
- Blood mixer
- Manual counter leukocytes
- ABL80 FLEX Analyzer
- Urine analyzer



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# PLATFORM 4

Bioimaging



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Vall d'Hebron Hospital Institut de Recerca



## U20. *In Vivo* Experimental Unit

### Services

- U20-S1. Non-invasive optical imaging (bioluminescence and fluorescence)
- U20-S2. Animal models in oncology
- U20-S3. *In vivo* Experimental consultancy
- U20-S4. *In vivo* Efficacy Assays of drugs, nanomedicines, biomaterials and others
- U20-S5. *In vivo* Toxicology

### Equipment

Optical imaging equipment:

- Xenogen IVIS<sup>®</sup> Spectrum for *in vivo*/ex vivo FLI and BLI imaging
- Leica MacroFluo<sup>™</sup> fluorescent microscope X-ray equipment
- Quantum microCT (Perkin Elmer)

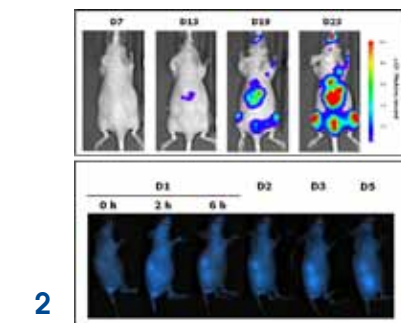
Equipment for histological processing:

- Tissue processor and embedding station for paraffin samples
- Paraffin microtomes
- Leica Autostainer XL for high quality staining
- Motic BA410 Microscope and digital digital documentation accessories

The Unit is supported by the Animal Facility of Vall d'Hebron University Hospital Research Institute (VHIR), with an area of 683 m<sup>2</sup> for animal housing and handling.



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1. Preclinical histology processing
2. Bioluminescent and fluorescent non invasive imaging
3. IVIS<sup>®</sup> Spectrum equipment



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Jesus Usón Minimally Invasive Surgery Centre (JUMISC)



## U21. Experimental Operating Rooms

### Services

- U21-S1. *In vivo* Efficacy Assays of drugs, nanomedicines, biomaterials and others

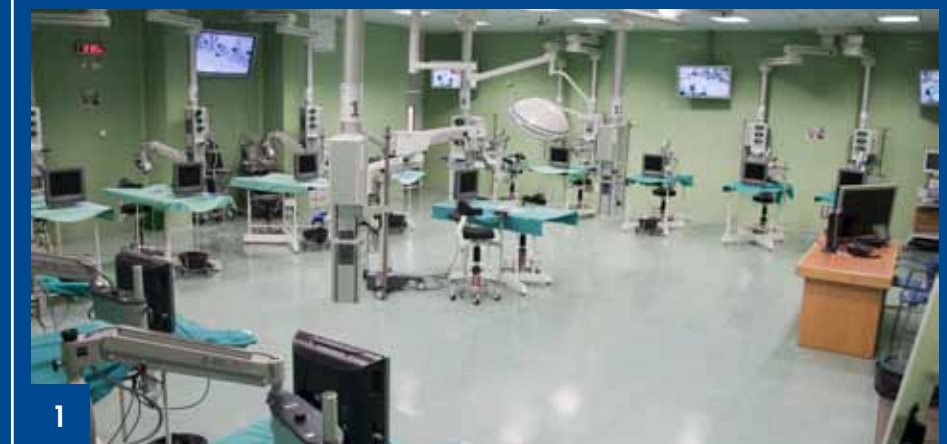
### Equipment

Facilities:

- Experimental operating rooms for small and large animal (inhalation anesthesia workstation, infusion pumps, electrocoagulation systems, laparoscopic surgery systems, endoscopic surgery, microsurgery, interventional and endoluminal surgery, orthopedics, etc.).
- Rooms for preparation and preanesthesia.
- Sterilization rooms for medical instruments and tools.

Integrated operating room:

- Laparoscopic Surgery equipment
- Endoscopy equipment
- Surgical microscopes
- Ophthalmology equipment
- Anesthesia workstations



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### Description

Experimental operating rooms with high technology and high field instrumentation to promote methodological and translational research class in Biomedicine, both minimally invasive surgery and new procedures and in preclinical development for technical evaluation, medical devices, biomaterials, etc. Surgical facilities allow the development and use of small and large animal models for research and experimental surgery in several longitudinal areas: cardiovascular diseases, liver and digestive diseases, respiratory and systemic diseases, endocrinology and urology, gynecological and reproductive diseases, pediatric diseases, orthopedics and traumatology, ophthalmology and experimental surgery in all organ systems have the infrastructure for transplant development, implants, prosthesis, biomaterials, etc. under high quality experimental conditions that allow surgery, clinical follow up and obtaining biological samples in these models.

1. Microsurgery lab
2. Laparoscopic lab

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## U22. Animal Housing

### Services

U22-S1. Animal Housing

### Equipment

Its perimeter area is 3,200 m<sup>2</sup>, and the net floor area is 2,865 m<sup>2</sup>. It has large rooms to house the experimental animals according to their species characteristics (age, sex, weight, breed) and to the research projects they are assigned to. Among the equipment and facilities there are: rooms for the maintenance of large animals, rooms for maintaining small ruminants, barrier zone for maintenance of rodents under SPF conditions, integrated operating room within the barrier area, multi-use rooms for rodents and lagomorphs maintenance, room for receipt and handling of animals, quarantine rooms pre-experimental process, room to perform small procedures and cures and preparation rooms for large animals prior to the surgical area.



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1. Main entrance animal housing  
2. Large animals 2 rooms

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## U23. Assisted Reproduction

### Services

U23-S1. In vitro fertilization studies and embryo classification  
U23-S2. Embryo culture media viability studies  
U23-S3. Micromanipulation and microinjection

### Description

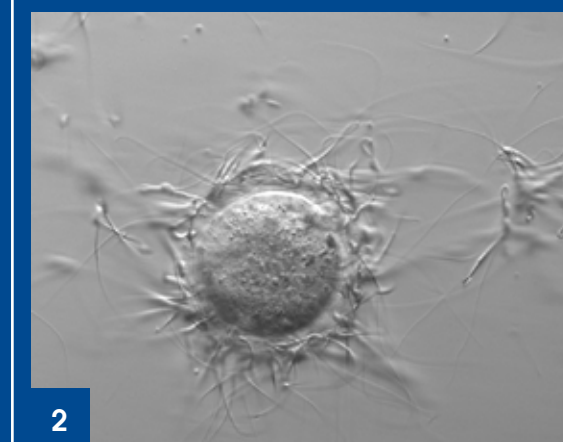
Located in the JUMISC, it has a 120 m<sup>2</sup> laboratory, small animal surgery, clinical analysis support, etc. Features with two intracytoplasmic micromanipulation equipment of the latest generation with IMSI, Laser and Oosight system, embryo biopsy systems, vision systems of the mitotic spindle, with flow cabinets with stereo-microscopes and heated plates, incubators with different gasses systems, equipment and cryopreservation freeze gamete and embryo, among others.

### Equipment

- Micromanipulator and microinjection of last generation in conjunction with the most advanced optical microscope
- IMSI system
- SATURN LASER systems to break zona pellicuda and biopsied embryos
- Vision systems of the mitotic spindle (Oosight system)
- Flow cabinets with stereo-microscopes and heated plates
- Incubators with different gasses systems
- Equipment and cryopreservation freeze gamete and embryo



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1. IVF laboratory  
2. In vitro fertilization



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## U24. Medical imaging

### Services

- U24-S1. Stem Cells Labeling
- U24-S2. Medical Imaging for Minimally Invasive Surgery

### Equipment

- Fluoroscopy
- Digital subtraction angiography system
- Ultrasound scanner
- Computed Tomography (CT) scanner
- 1.5T Magnetic Resonance Imaging (MRI) system
- Cardiac electrophysiology lab with navigation (CARTO XP) and biotherapeutics delivery (NOGA XP) systems



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1. Magnetic Resonance
2. NOGA

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Universitat Autònoma de Barcelona (UAB)



### Description

The platform is divided between the Servei de Ressonància Magnètica Nuclear (Nuclear Magnetic Resonance Facility) (SeRMN) (<http://sermn.uab.cat/>) and the Institut de Biotecnologia i Biomedicina (IBB) for bioinformatics applications of the UAB. This platform is coordinated by Prof. Carles Arús, PI of the Nuclear Magnetic Resonance Biomedical Applications Group (GABRMN) (<http://gabrmn.uab.es/>), with a recognized research track record in the use of NMR as a tool for biomedical applications, and more specifically to identify biomarkers of different pathologies. The main objective of the Platform of Biomedical Applications of Nuclear Magnetic Resonance at the Universitat Autònoma de Barcelona (UAB) is the acquisition, processing and/or interpretation of Nuclear Magnetic Resonance data.

1. Schematic in-vivo DNP process
2. Schematic dissolution Dynamic Nuclear Polarization (DNP) process.

## U25. NMR: Biomedical Applications I

### Services

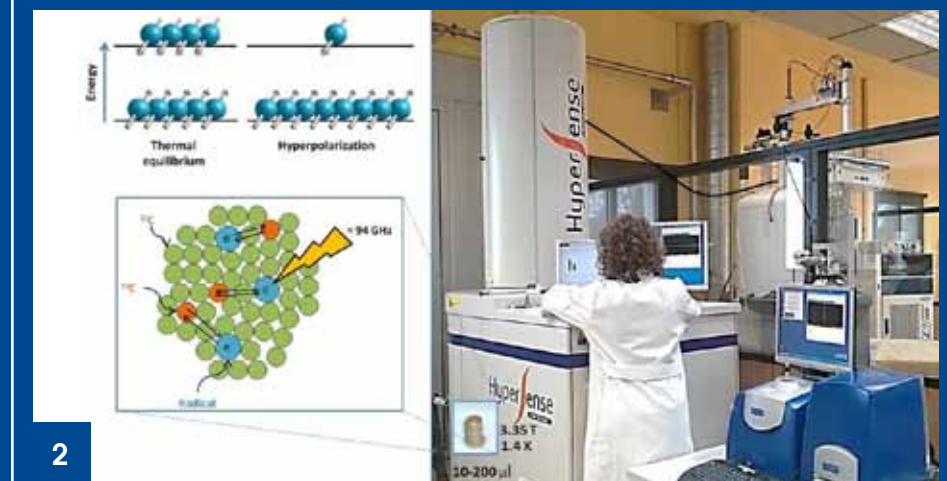
- U25-S1. NMR spectrometer 250MHz robot/250MHz auto/360MHz/400MHz
- U25-S2. NMR spectrometer 500MHz/600MHz
- U25-S3. NMR spectrometer 400 MHz with HRMAS/CPMAS probes
- U25-S4. 500 MHz spectrometer HPLC-NMR
- U25-S5. Preclinical horizontal spectrometer Biospec 7T
- U25-S6. Dynamic nuclear polarizer HyperSense®
- U25-S7. Focused Microwave Fixation system
- U25-S8. NMR consultancy for processing and interpreting data
- U25-S9. Access to specific software and database

### Equipment

- Two AVANCE 250 MHz (5.8T)
- AVANCE 360 MHz (8.4T)
- AVII 400 MHz (9.4T)
- AVIII 400 MHz (9.4T)
- AVANCE 500 MHz (11.7T)
- AVIII 600 MHz (14T)
- BioSpec 70/30 300 MHz (7T)
- Focused Microwave Fixation System
- HyperSense® sample polarizer
- Animal housing
- Software packages
- Databases of human brain tumour data



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# U26.NMR: Biomedical Applications II

## Services

U26-S1. DRX-600 Bruker with autosampler

## Equipment

DRX-600 Bruker NM R equipment (14 Teslas):

- 4-channel electronic systems with applications in fluids, tissues, biomaterials and microimaging
- Thermostating system for fluids and tissues, and for molecular imaging and microimaging
- Set of coils: fluids 5 mm, micro-fluids 1 mm, tissues (High Resolution Magic Angle Spinning, HR-MAS) + pneumatic and microimaging system for 10, 5 and 2 mm.
- 60 Amp GREAT unit for each X/Y/Z axis of the field gradients
- <sup>13</sup>C selective device with 1H decoupling
- 2D microcoil for 500 μm and 100 μm microsamples
- Refrigerated SampleJet autosampler with temperature control for 60 Samples

Microcamera for its use in the NM R equipment for:

- the simultaneous determination of structural images (dimensions and sections of 50 μm and less)
- metabolic images (voxel sizes < 200 μm) in model systems

11T NMR equipment with the following probes:

- HR-MAS
- Cryoprobe
- Multinuclear probe with service for metabolomics for tissues, cell lines and biofluids



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## Description

Located in the Faculty of Medicine of the University of Valencia (UV) has a laboratory with a NMR (14T) for acquiring unique metabolic profiles of biofluids, cell lines and tissues. This Unit is coordinated by Dr. Ramón Martínez Máñez, PI of the Applied Molecular Chemistry Group of the Universidad Politécnica de Valencia, together with Dr. Salvador Gil, Director of the Central Service for Experimental Research (SCSIE).

1. DRX-600 Bruker NM R equipment (14T) with refrigerated autosampler
2. Sample preparation lab



# PLATFORM 5

High Performance Computing

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 Universidad de Zaragoza



# U27. High Performance Computing

## Services

- U27-S1. Remote access to HPC
- U27-S2. Software installation on demand
- U27-S3. Biomedical signals processing, especially in cardiology
- U27-S4. Modeling of the functional behaviour of tissues and organs

## Equipment

Hermes cluster:

- 200 computing nodes (including GPU)
- 1534 computing cores (AMD 6128/ Intel E5520) with 2GB per core
- 700 computing cores (Intel Xeon 2600/1200 V3) with 4GB per core
- 6 TB RAM
- 6 GPU Fermi architecture
- 8 GPU Maxwell architecture
- QDR Infiniband, 10Gb Ethernet, 1Gb Ethernet
- Linux SO

Open source software:

- C/C++ compilers (gcc & Intel)
- Fortran compilers (gcc & Intel)
- Intel MKL libraries
- OpenMPI & MVAPich with infiniband
- BLAS, ATLAS AND LAPACK libraries
- Python 2.4/2.6/2.7/3.3

Licensed software:

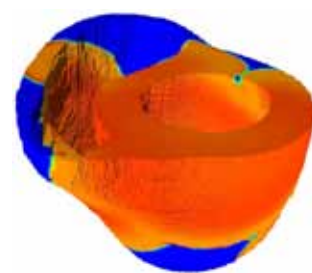
- Matlab R2014/R2012/R2011/R2010
- Abaqus 6.13/6.11/6.9
- Comsol 4.3/4.2/4.1
- Adina 8.5/8.7/8.9
- Ansys CFX 14.5
- Gaussian
- LS-Dyna
- Simics 3.0.31
- ADAMS 2013

## Description

Located at the Aragon Institute of Engineering Research (I3A), an Interdisciplinary University Research Institute specialized in engineering of the University of Zaragoza, this HPC service counts with a conditioned room to host a cluster of computers that allows remote access for High Performance Computing, massive storage and different software applications for the research in four divisions: Biomedical Engineering, Information and Communications Technologies Division, Processes and Recycling Division and Industrial Technology Division. This Unit is coordinated by Prof. Pablo Laguna, PI of the Biomedical Signal Interpretation & Computational Simulation Groups (BSICoS).

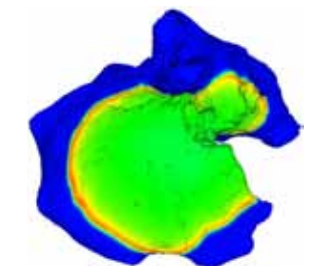


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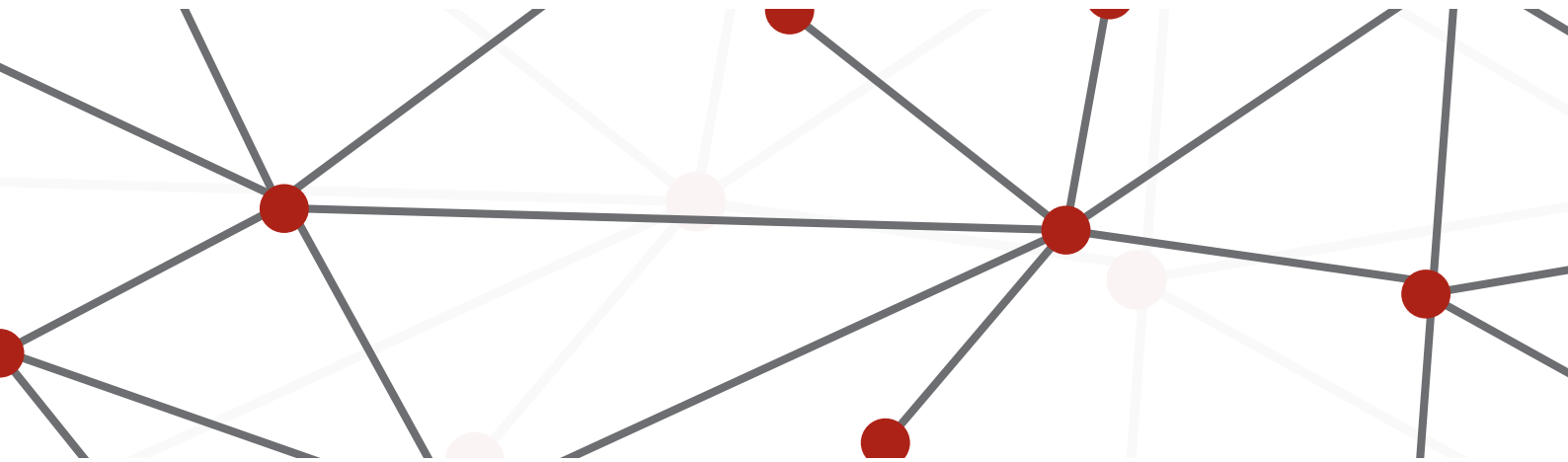


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1. High Performance Computing
2. Ventricular Activation Modeling
3. Modeling Activation Headset



3



**ciber-bbn**  
Centro de Investigación Biomédica en Red  
Bioingeniería, Biomateriales y Nanomedicina



Centro de Cirugía de Mínima Invasión  
Minimally Invasive Surgery Centre  
Jesús Usón