Scientific Facilities and Research Platforms

Scientific Facilities at the CNB are one of the most important assets of the centre. They provide access to leading-edge technology in the areas of imaging, structural and cell biology, genetically modified mouse models, -omics and bioinformatics. In the last years we have received funding for the acquisition of new state-of-the-art technologies and equipment such as Microscopes and Flow Cytometers to improve the quality or our services.

The centre also stands out for its research installations, which include a specific pathogen-free animal facility, a greenhouse, and one of the few high-level biocontainment (BSL-3) laboratories currently operative in Spain. Specialised personnel offer technical support in many other facets of the centre's scientific activities.

Our core technologies are well established locally and nationally and act as host or partners in several European Research initiatives. In this regards, the CNB hosts two centres of the European Strategic Forum for Research Infrastructures (ESFRI) Projects, the Spanish node of INFRAFRONTIER, that includes the European Mouse Mutant Archive (EMMA), and the Spanish Instruct-ERIC Center, that includes the Instruct Image Processing Centre (I2PC) and the CNB-CSIC cryoelectron microscopy Facility.

New National and International Scientific Research Platforms are running in the institute, such as the CNB Antiviral Platform, created during COVID-19 pandemic or the Standard European Vector Architecture 4.0 (SEVA).

Advanced light microscopy

HEAD

Ana María Oña Blanco

SCIENTIFIC COORDINATOR

José María Requejo Isidro

PERSONNEL

Gianluca D'Agostino
Jaime Fernández de Córdoba

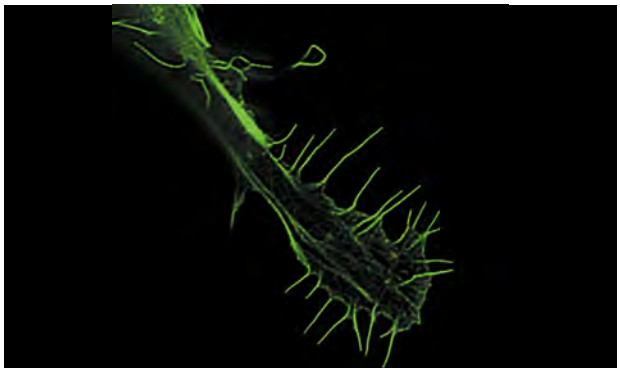
Optical microscopy, and in particular fluorescence microscopy, is one of the most powerful tools for the study of key problems in the life sciences, allowing the study of unlabelled and/or fluorescently labelled species in the space and their evolution over time with macromolecular spatial resolution.

The Facility provides state-of-the-art infrastructure for epifluorescence, transmission imaging, confocal laser scanning microscopy, TIRFM and STED nanoscopy. Applications available include: cell dynamics, multi-position acquisitions, multi-channel imaging (2D, 3D, 4D), sub-cellular localisation, FRET, FRAP, mosaic and 3D reconstructions, as well as the use of image processing and analysis tools, covering the main experimental imaging approaches in optical microscopy.

The Facility will be equipped in 2023 with a new confocal nano- and mesoscopy system that will allow the use of new imaging techniques: STED, FLIM, FCS and a Lightsheet.

Our staff offers scientific-technical assistance in the use of the equipment, experimental protocols, image processing and analysis procedures. We also provide aliquots of probes, antibodies and supports for widespread use in light microscopy.

Super-resolution (STED) image of a HeLa cell filopodium with actin filaments labelled with Alexa Fluor™ 488 Phalloidin. The image was acquired with the Leica TCS SP8 multispectral confocal system with a 3X STED module.



Quantitative image analysis unit

HEAD

Carlos Óscar Sorzano Sánchez

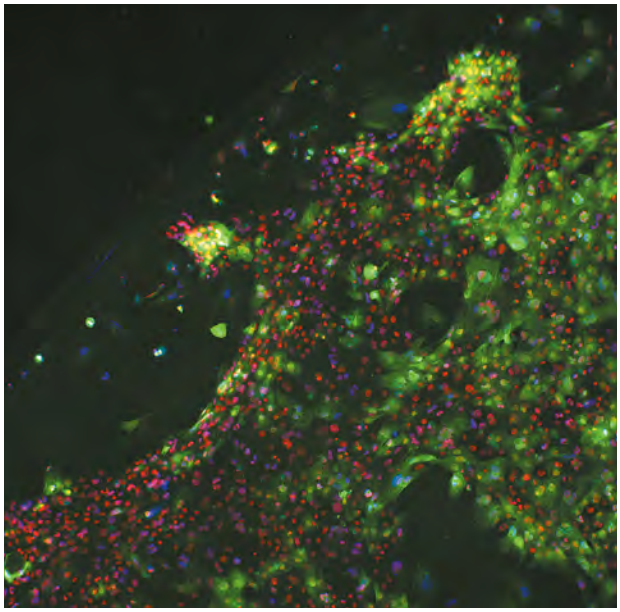
PERSONNEL

Ana Cayuela

This unit develops image processing algorithms to perform a quantitative analysis of the images produced by the Advanced Light Microscopy facility of the CNB.

In particular, we help to automatically track single particles or cells, characterising their trajectories, diffusion features and fission or fusion events. We are also able to classify cells into different phenotypes, quantitatively assessing the fluorescence intensity under various conditions or identify spatial relationships beyond colocalisation and image segmentation.

Our expertise includes also the development of deep learning algorithms to be applied in light microscopy.



Cryoelectron microscopy

HEAD

Rocío Arranz

PERSONNEL

Francisco J. Chichón
José Javier Conesa
M.Teresa Bueno-Carrasco
Noelia Zamarreño

David Delgado-Gestoso
Javier Collado-Ávila

VISITING SCIENTIST

Rhian Jones
(University of Marseille, France)

The cryoelectron microscopy facility offers services including sample preparation, screening and image collection for cryoelectron microscopy and cryoelectron tomography. It hosts tree microscopes: A 300 kV JEOL CryoARM microscope equipped with autoloader, a Gatan direct electron detector and Omega energy filter and a 200kV FEI Talos Arctica microscope equipped with autoloader and a Falcon III direct electron detector can be used for high resolution studies using single-particle methodology and cryoelectron tomography and additionally, a 120 KV JEOL JEM 1400 microscope for sample screening. The service has different apparatus for specimen vitrification: a FEI Vitrobot, a Leica EM CPC, a Leica EM GP2 and a high pressure freezer Leica EM ICE. We are also offering two new services: cryocorrelative microscopy and microelectron diffraction. The cryocorrelative microscopy technique allows the analysis by cryo-optical microscopy using a Zeiss LS900 AiryScan microscope and cryoelectron microscopy. The use of a Zeiss CrossBeam 550 cryo-FIB-SEM microscope allows direct visualisation of cells for tissue-cell resolution or for preparation of thin lamellas.In MicroED diffraction of nano crystals, the TEM is used to diffract crystals of the complete range of molecules that could be crystallised: from small compounds to macromolecules.

Cryoelectron microscopes: 200kV FEI Talos Arctica and JEOL CryoARM300

Instruct image processing center – I2PC

HEAD

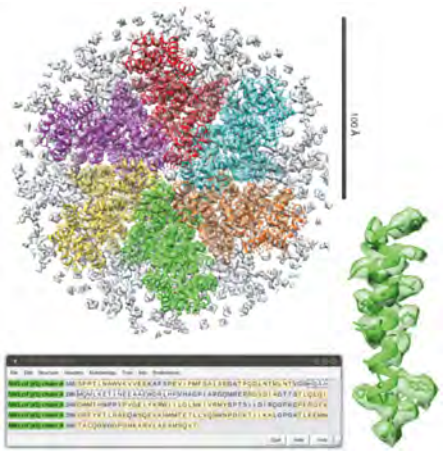
José María Carazo

PERSONNEL

Carlos Óscar Sorzano
(Technical Director)
Blanca E. Benítez
Pablo Conesa

Yunior Fonseca
Alberto García Mena
Marcos Gragera
Jorge Jiménez
Roberto Melero

The Instruct Image Processing Centre (I2PC) is the reference laboratory for the image processing of Cryo-Electron Microscopy (CryoEM) acquired data within Instruct-ERIC (the European infrastructure for Structural Biology). Our contribution is two-fold. On one-hand we develop infrastructure software for the support of image processing in CryoEM throughout Europe and the world. On the other hand, we serve the community by helping experimentalists to obtain three-dimensional structures of the biological macromolecules of their interest. These projects must be approved by Instruct and are channelled to us for their solution. Experimentalists can submit their data, come to learn how to process it, or even have a short internship (3-6 months) through Instruct. The I2PC is very active in giving training courses and seminars on all the image analysis techniques related to CryoEM.



Electron microscopy

HEAD
Cristina Patiño

PERSONNEL
Beatriz Martín
Pablo Sola
Miriam Guerra
Juan Pablo Hernández

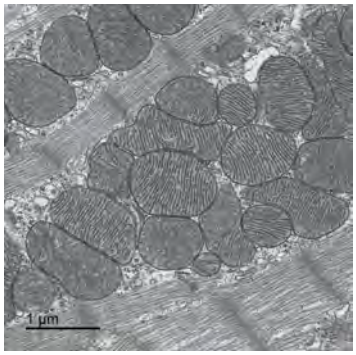
The CNB electron microscopy service provides scientific-technical support to research groups for the study of biological samples by transmission electron microscopy.

Technical staff offers training in the use of equipment and advise on the appropriate techniques for ultrastructural and immunocytochemical analysis of macromolecular complexes, viruses, bacteria, eukaryotic cells and tissues.

We also offer specialised sample preparation, microscopy analysis, data collection and support for results interpretation.

In addition, techniques that combine optical and electronic microscopy are performed. These CLEM (correlative light and electron microscopy) techniques enables to obtain a complete overview of a cell at the same time analyse biomolecules in that same cell on the scale of a few manometers. It also allows the observation of rare objects or events in light microscopy and their subsequent ultrastructural localization in an electron microscope.

The facility is equipped with a 120-kV transmission electron microscope (Jeol 1400 Flash) with a high-resolution camera (Gatan OneView) and for sample processing the facility disposes of an ultramicrotome Reichert-Jung Ultracut, a cryo-ultramicrotome Leica UC6-FC6, a specimen trimming device Leica EM Trim, an automatic freeze-substitution system Leica AFS-2, a carbon coating equipment Leica AC600, a high-pressure vitrification unit Leica EM PACT2 and a light microscope Leica DM2500 with digital camera.



Ultrathin section of cardiac muscle embedded in epoxy resin. Jeol 1400, magnification 10.000.

Macromolecular X-ray crystallography

HEAD
César Santiago

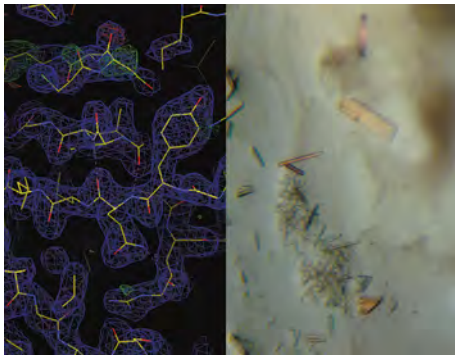
Protein x-ray crystallography is a high-resolution technique that allows us to study protein structure at atomic level. This method provides a detailed view of protein function, ligand and protein interactions, supra molecular organization and mutants related to human diseases. Great improvements both in crystallisation techniques, and software for structure resolution and refinement have been achieved since the last decade, increasing the chances of solving a macromolecule structure.

The macromolecular X-ray crystallography facility provides the following techniques:

- Advice and supervision on protein production from cloning to expression in bacterial, yeast and eukaryotic systems.
- Support and training on protein purification to obtain crystal-grade protein for crystallisation.
- Automated macromolecular crystallisation.
- Crystallisation conditions optimsation applying standard and in-house techniques.
- Crystal mounting. Access to synchrotron beam time. X-ray diffraction data collection.
- Data processing and structure resolution and analysis.

Service equipment:

- Mosquito Xtal3 crystallisation robot.
- Genesis RSP 150 workstation (Tecan Trading AG) nanodispenser robot.
- Two temperature controlled crystallisation rooms.



Flow cytometry

HEAD

María del Carmen Moreno-Ortiz Navarro

PERSONNEL

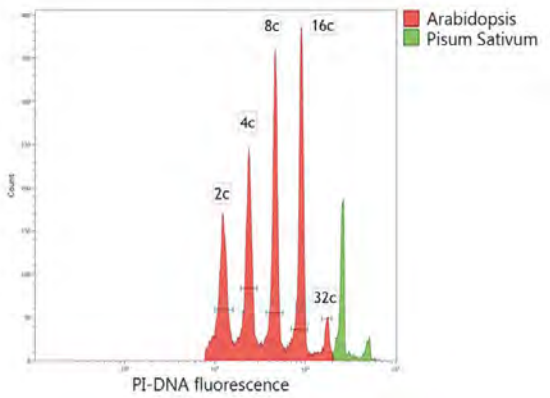
Miguel A. Sánchez Luengo

Flow cytometry is a powerful tool used in different fields (plants, microbiology, oncology,...). Is a high throughput and multiparametric technique that allows the characterisation and separation of cells and particles in suspension using different lasers and optical detectors.

In the Unit there are two types of instruments: analysers that can be used for cell analysis only or cell sorters which can perform cell analysis and cell sorting simultaneously. Currently, the Unit has 5 analysers based in conventional cytometry with the capacity to detect up to thirteen colors simultaneously, and one high speed cell sorter with the capacity to separate up to four population of cells at the same time. Recently the Unit has been equipped with a new analyser based in spectral cytometry that allow detection of more than 40 colors simultaneously which will allow to solve complex problems in research.

The Unit offers training for the self-use of analysers, assistance on the design of experiments, sourcing and supply of reagents, support and courses of data analysis, presentation and interpretation as well as troubleshooting of machines and experiments.

Ploydia´s analysis of homogenates prepared from Arabidopsis thaliana Col-1 leaf tissue and internal standard Pisum sativum.



Protein tools unit

HEAD

Leonor Kremer

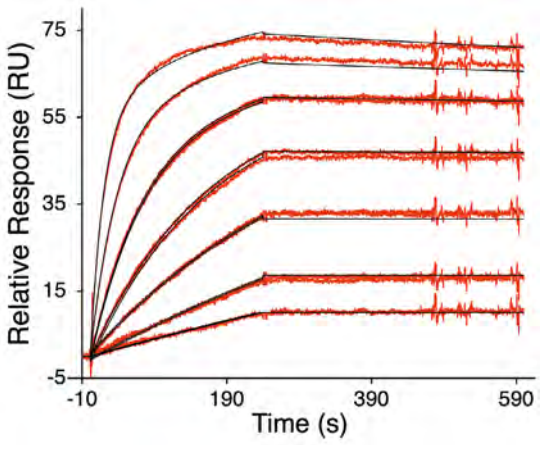
PERSONNEL

María Teresa Martín
Elena Ramos Serrano

The Protein Tools Unit is a scientific facility focused on immune response studies, generation and characterisation of monoclonal antibodies, design of immunoassays, and real time analysis of molecular interactions. The Unit is a founding member of EuroMAbNet, the non-profit European organisation of academic laboratories specialised in the production of mAbs.

Antibodies, immunoassays and related services are provided to CSIC scientists, universities, public organisations and private companies. The laboratory also offers technical assistance and advice on the analysis and interpretation of data, the training of external users, and the development of new techniques. We organise theoretical and practical courses and help with the preparation of manuscripts. In this period, new mAbs against SARS-CoV-2 and human tumour antigens were generated and characterised.

The facility is equipped with a BIAcore 3000 instrument that integrates surface plasmon resonance (SPR) technology with a microfluidic system to monitor molecular interactions in real time. Its high sensitivity allows the detection and studies of kinetic constants and affinity of small drug-protein, protein-protein, RNA-protein, DNA-protein, carbohydrate-protein, and lipid-protein interactions.



Transgenesis

HEAD

Mª Belén Pintado

PERSONNEL

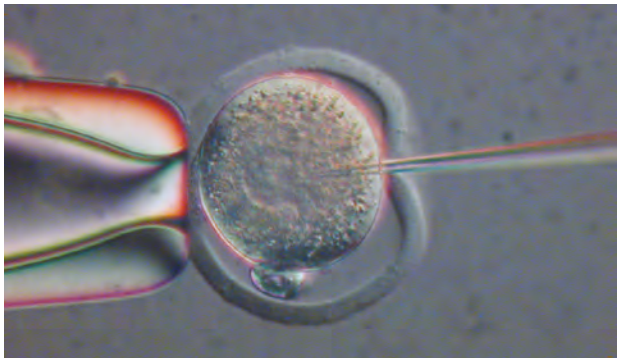
Verónica Domínguez Plaza
(CBMSO)
Mélani Margullón Cardoso
Mª José Palacios Barea
(2021)

The Transgenesis Service is a joint scientific service of CNB and CBMSO that provides support to internal and external research groups in the creation, interchange and management of genetically modified mouse models. The service covers all the required steps for this purpose: from founder generation to breeding and management of lines. Models are generated by additive transgenesis, ES cell derived gene targeting and CRISPR/Cas9 based genome edition either with embryo microinjection for large insertions or electroporation for KO or small insertion models.

The Transgenesis Service offers technical and scientific support, complementing the expertise of our customers, advising on the best strategy to obtain the desired model and also providing genotyping support if needed.

The service counts with two fully equipped microinjection settings, one electroporator specifically designed for embryo edition, a standard molecular biology laboratory and a laboratory for ES cells. The service is integrated in the scientific-technological platform INNOTEK (UAM+CSIC). We also provide rederivation of mouse lines and on-demand design and testing of guides for the genome edition of embryos and mammalian cell lines. The general activity of the service is complemented with the organisation and the participation in specialisation courses and master programs.

Pronuclear CRISPR/Cas9 microinjection in a 1-cell mouse embryo x200



Mouse embryo cryopreservation

HEAD

Lluís Montoliu

PERSONNEL

Julia Fernández
(technical manager)

María Jesús del Hierro
Marta Castrillo
Cristina Robledo Bernal
Inés Arroba
(CIBER)

The CNB mouse embryo cryopreservation facility offers to researchers the possibility to freeze, maintain and rescue transgenic and knockout mouse lines in the form of embryos and/or sperm, hence contributing to current animal welfare recommendations and complying with the associated legislation on animal experimentation. Current methods available include freezing sperm, oocytes and/or embryos, the thawing of sperm, oocytes and/or embryos previously frozen and the subsequent revitalisation of the cryopreserved mouse lines through in vitro fertilisation, assessment and/or logistical support for importing/exporting frozen or refrigerated embryos or sperm, from and to the CNB, and quality controls and genotyping procedures. The facility can also produce genome-edited mouse models using the latest CRISPR-Cas9 tools through embryo electroporation.

The CNB hosts the Spanish node of the European scientific research infrastructure (ESFRI) called INFRAFRONTIER, which includes the European Mouse Mutant Archive (EMMA), and whose objective is the generation, phenotyping, cryopreservation, organised archiving and coordinated distribution of mouse lines of interest in biomedicine. EMMA has more than 8,400 mouse mutant lines cryopreserved and is composed of 16 nodes that are present in 13 European countries. More than 550 of those mouse lines are cryopreserved and offered from the Spanish node at CNB. The CNB mouse embryo cryopreservation facility has signed scientific cooperation agreements with the Spanish National Cancer Centre (CNIO) and with the Centre for Animal Resources and Development (CARD) at the University of Kumamoto (Japan) for the archiving and distribution of mutant mouse lines of interest in biomedical research.

Histology

HEAD

Lluís Montoliu

PERSONNEL

Soledad Montalbán
(technical manager)
Óscar Sánchez
Inés Arroba
(CIBER)

The CNB histology facility offers the preparation of animal and plant biological samples for their histological analyses. All requests are received and processed electronically, through the established facility's registration procedure at the devoted web site, available in Spanish and in English. Offered methods and procedures include the preparation of wax (paraffin) and plastic (resin) blocks with biological specimens embedded, and the corresponding generation of histological sections with one of the two available automated microtomes. The Histology facility also offers the preparation and sectioning of frozen blocks with the cryostat. The orientation, width and arrangement of the sections can be specified by the user. All sections can be counterstained with any of the available staining procedures (haematoxylin/eosin, cresyl violet, PAS, Mason's trichrome, elastin fibres/Van Gieson/Sirius Red, etc.) or can be processed subsequently for immunohistochemistry. The facility implements new staining procedures or histological methods upon request.

The CNB histology facility has an ample experience in processing a large variety of animal and plant tissues and organs. The CNB histology facility coordinates a joint platform with the IIB-UAM/CSIC histology facility, offering to CNB and IIB researchers a larger processing capacity for histological samples.

Genomics

HEAD

José Manuel Franco Zorrilla

PERSONNEL

Marta Godoy

The genomics facility is focused on the analysis of gene expression from biological samples using microarrays, interrogating the activity of complete genomes in a single experiment, and contributing to the elucidation of the genetic basis of the biological processes.

The facility analyses several commercial and custom microarrays, and the services include microarray printing and design, analysis of RNA integrity and microarray hybridisations. Raw data are statistically analysed using "state-of-the-art" algorithms, and filtered results are supplied to customers in a web-based easy-to-use tool developed by the facility. The facility offers support in the use of several bioinformatics tools for functional analysis, helping customers in the biological interpretation of their results.

The facility also offers the possibility of validating gene expression data by real time qPCR.

Proteomics

HEAD

Fernando J. Corrales
Alberto Paradela

PERSONNEL

Lorena Carmona
Miguel Marcilla
Sergio Ciordia
Manuel Lombardía
Fátima Santos
Patricia Gómez
Rosana Navajas
Jorge Vindel
José Ramón Lamas
Laura Guerrero
Irene Blázquez
(TFM)
Carla Díaz
(TFG)

The Functional Proteomics Service at the CNB provides resources to identify, characterise and quantify proteins, either purified or as complex mixtures from any biological system. Unsupervised protein quantification by label free or isobaric labeling, targeted quantification, posttranslational modification analysis, analysis of HLA peptide repertoires and structural proteomics are some of the main routine workflows already set up in the lab. Moreover, there is a continuous update of our technological portfolio to maintain competitivity in a highly dynamic field such as proteomics.

During the 2021-2022 term new state-of-the-art instruments have been installed and are 100% operative. Moreover, a top LC-platform has been granted and will be installed in early 2023. In the 2021-2022 period, we have performed 4138 proteomic analyses for 404 users, that included sample prep, nLC-MS/MS analysis and data processing with a preliminary functional interpretation.

In regard of COVID-19 pandemic, we have synthetised and purified more than 100 peptides.

We are currently working in two main aims, first, to enhance our capacities in structural proteomics: intact protein characterisation and protein-protein interaction analysis (combining peptide crosslinking and mass spectrometry). Second, to define new strategies for the analysis of posttranslational modifications of proteins (including targeted and open-search analysis for epigenetic histone modification patterns).

Bioinformatics for genomics and proteomics

HEAD

Juan Carlos Oliveros Collazos

PERSONNEL

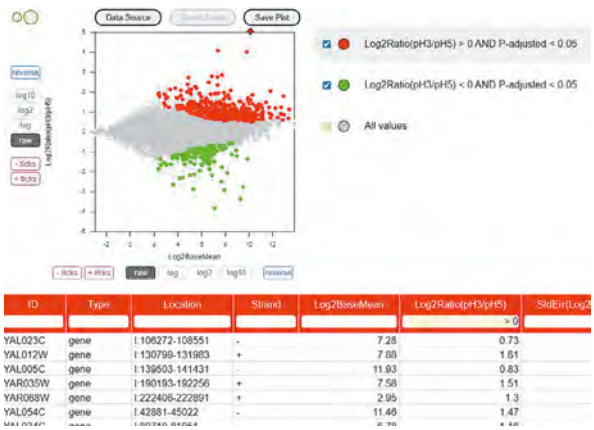
Juan Antonio García-Martín
Rafael Torres-Pérez

Our service provides CNB's research groups with bioinformatic support for the analysis, visualisation and interpretation of both genomics and proteomics-related projects. Among other services, we provide:

- Assistance on experimental design for experiments involving deep sequencing and other high-throughput technologies
- Biostatistical support for extracting quantitative results from genomics or proteomics projects
- Functional annotation of relevant list of genes or proteins
- Periodic courses and tutorials on bioinformatics
- Development of computational tools to make popular algorithms and pipelines more accessible to researchers.

In short, at the BioinfoGP service, we try to fill the gap between the complex outcome of the many powerful biostatistical methods available and the final researcher's needs.

SeqNjoy: Complete RNA-Seq workflows in your Desktop



Scientific computing

HEAD

José R. Valverde

PERSONNEL

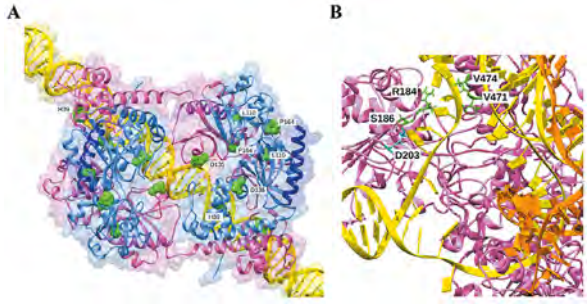
Alejandro Melones
Antonios Kapogiannatos
Irene Sainz de la Maza

The Scientific Computing Service cooperates with researchers inside and outside the CNB to perform complex data analyses. It currently provides support on Bioinformatics, Metabolic Modeling, Structural Biology, Immunoinformatics, Statistics, Artificial Intelligence and Data Science.

The service participated in two funded national projects, to study IBDV infections in *C. japonica* and *G. gallus*, and to study autophagy in *D. discoideum*. We also cooperated in the analysis of vaccines for HIV and SARS; drug screening against COVID-19; the pangenomic analysis of 27000 complete E. coli genomes; the study of antibiotic resistance in *P. aeruginosa* and *S. maltophilia*; and the development of advanced metabolic analysis tools, an ab initio protocol for protein structure prediction; and various AI/ML tools.

The Service regularly organises courses in Biostatistics and R programming; run an online course on Metagenomics (with U. of La Rioja and U. of Cuyo, Argentina). We received national and international (ERASMUS+) students to carry out undergraduate and master internships and participated in outreach activities such as Nanociencia and the 4ºESO+EMPRESA program.

Modeling of the effect of antibiotic resistance and compensatory mutations in the structures of AmpR and RpoB (Hernando-Amado, S., Laborda, P., Valverde, J. R., & Martínez, J. L. (2022). Rapid decline of ceftazidime resistance in antibiotic-free and sublethal environments is contingent on genetic background. Molecular Biology and Evolution, 39(3), msac049).



Biological safety and radiation protection

HEAD

Fernando Usera Mena

PERSONNEL

Aránzazu de la Encina Valencia
(coordinator)
María Teresa Bartolomé Jiménez
Marta Sanz Martínez
Luis Carlos Guardado Guerra

OCCUPATIONAL RISK PREVENTION UNIT

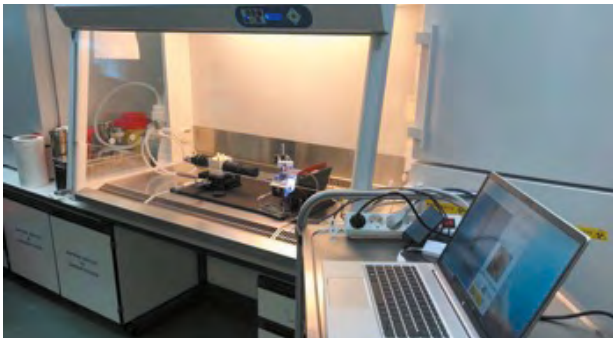
Nuria Martín Montes

Service activities:

- Evaluation of biological Chemical and radiological risks
- Design of laboratories
- Management of official authorizations and monitoring of compliance with regulations
- Issuing of guidelines and operating procedures
- Risk prevention training
- Acquisition protection equipment
- Medical and dosimetric surveillance
- Management of accidents and emergencies
- Management of biological, toxic and radioactive waste

Research activity: research on SARS-CoV-2 and other high-risk pathogens: new viricides, survival and routes of transmission

Occupational Risk Prevention Unit: Occupational health and safety in areas not related to experimental activities: health, safety and ergonomics. Coordinating business activities regarding safety and health.



Animal facility

HEAD

Ángel Naranjo

RESEARCH TECHNICIAN

Javier Martín

SHIPMENT COORDINATOR AND ADMINISTRATION

Alberto García

AREA AND COLONY MANAGERS

Eladio Martínez
Antonio Morales
Raquel Gutiérrez
Iván Jareño
Isabel Rodríguez
Patricia Sanz

ANIMAL TECHNICIANS

Raul García
Alfonso Machado
Sergio Jiménez
Carina Solange
Marcelle Gómez
Elena Olivas
Guillermo Meza
Ignacio Ureña
Selvin Rápalo

The CNB laboratory animal facility is an area dedicated to the production and maintenance of experimental animals, aiding in research, essential techniques, and legal support for this duty. Most of the experimentation is carried out with genetically modified mice. The laboratory animal service provides a controlled environment for the animals, with periodic control of diet, water, temperature, air, housing, and husbandry conditions. The unit is separated into several areas: quarantine, conventional, and specific pathogen-free (SPF), depending on the microbiological status of the animals. The facility provides special housing conditions for conventional, genetically modified, and immunodeficient animals, depending on the experimental objectives. At the same time, a totally isolated biosafety area is dedicated to *in vivo* experiments using biological agents.

The animal facility staff delivers services to laboratories for obtaining commercial lines and strains of animals, shipping animals for collaboration with other institutes, as well as maintenance, breeding, and generation of transgenic, knock-out and knock-in animals. These services allow control of the microbiological and genetic quality of the animals used in experimentation. The animal facility staff provides services for various techniques used in mouse research models, research assistance in surgical techniques, selection of animal models, animal health surveillance, laboratory animal care, and animal well-being. The facility also organises courses for continued education and to obtain accreditation for working with animals and manage colonies of genetically modified animals.

The facility's goal is to achieve research excellence following the 3R principles: reduction, refinement, and replacement of animal experiments.

Greenhouse

HEAD

Tomás Heras Gamo

PERSONNEL

Alejandro Barrasa Fuste
Joaquín Rivera Cuesta

The greenhouse service takes care of the following facilities specific for plant cultivation:

- A standard greenhouse with 8 cabinets (total growth surface: 180 m2)
- A P2 safety level greenhouse with 4 cabinets (total growth surface: 83 m2)
- 16 climate chambers

The greenhouse Service carries out the following tasks:

- Growth and propagation of plants under controlled environmental conditions
- Growth and propagation of mutant and transgenic lines under controlled environmental conditions
- Identification, selection and phenotypic analysis of mutant and transgenic plants

Biosafety level 3 laboratory and radioactive facility

HEAD

Fernando Usera Mena

PERSONNEL

Aránzazu de la Encina Valencia
(coordinator)
María Teresa Bartolomé Jiménez
Marta Sanz Martínez
Luis Carlos Guardado Guerra

Biosafety level 3 laboratory

The three BSL 3 sub-laboratories are equipped with the installation necessary for safely handling of high risk pathogens, including a changing room and shower for personnel and a steam steriliser, air lock, pass through box for material, an effluent treatment plant, data transmission network and remote alarm systems.

Research equipment includes biosafety class IIA cabinets, CO2 cell culture incubators, microbiological incubators, fluorescence microscopes, ultracentrifuge, refrigerated centrifuges and microfuges, ultra-freezers, etc.

Radioactive facility

The CNB radioactive facility is equipped with all the required systems of shielding, containment and detection of ionising radiation.

Research equipment includes a gamma irradiator, cabinets for radioisotopes beta and gamma, Biosafety class IIA cabinets, CO2 cell culture incubators, centrifuge and microfuge, inverted optical microscope, and others.

Photography

HEAD

Inés Poveda
(until February 2021)

The CNB photography service supports scientists with the photographic material necessary for their research and the dissemination of their results.

Photos are taken on a reprographic table with continuous lighting or with studio flashes against an adjustable background, and illumination with white or ultraviolet light, as needed.

The photography service also manages image processing and, when required, photo retouching; digital images are made accessible to clients on dedicated servers.

The service offers digital color printing of large format posters and, on request, also provides advice for graphic and image design.

Cell culture, washing and sterilisation

HEAD

Rosa Mª Bravo Igual

PERSONNEL

Carmen Berdeal Mera
Margarita Felipe Hombrados
Isabel Martín-Dorado
Ana Montero Moral
Ana Isabel Nieto Jiménez
Josefa Pérez Alfaro
Rosa Ramos Hernández
Anunciación Romero
Ángel Valera López

EXTERNAL PERSONNEL (CLECE)

Alioune-Aboutalib Sow
María Teresa Amado Jiménez de los Galanes
Vanesa Vara Martínez

Services

- Preparation of cell culture media
- Routine cell culture procedures
- Washing, sterilisation and replacement of laboratory material

Workshop

HEAD

Daniel Pastora

Services

- Machining metal and plastic parts
- Custom manufacture of metal structures
- Welding and repair of steel carts

Equipment

- Parallel lathe
- Milling machine
- Power welding set
- Spot welding equipment
- Mitre saw
- Reciprocating saw
- Automatic slitter
- Bending machine
- Grinding machine
- Column drilling machine

Instrumentation

HEAD

Ismael Gómez López

PERSONNEL

Juan Ignacio Golpe de la Fuente
Carlos González Redondo

Services

- Calibration and validation of scientific instrumentation
- Maintenance and repair of scientific instrumentation
- Technical advice during the acquisition of scientific-technical equipment
- Supervision of the installation of scientific-technical equipment
- User training for scientific-technical equipment

Antiviral screening platform

SCIENTIFIC COORDINATORS

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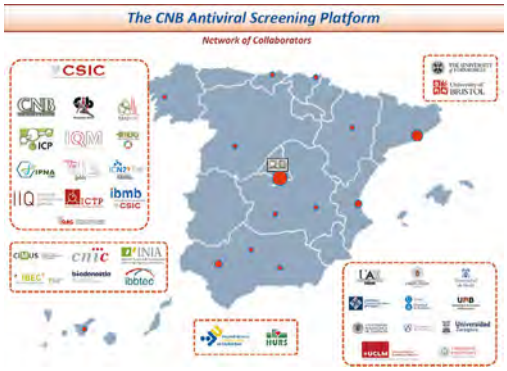
The objective of the CNB Antiviral Screening Platform is to provide a permanent structure dedicated to the identification and characterisation of antiviral compounds against human pathogenic viruses of biomedical relevance.

The working model is based on the use of unbiased phenotypic cell culture screening systems of viral infections including: SARS- CoV-2, dengue, West Nile, hepatitis B and C viruses as well as influenza A virus. To do so, we have established a nationwide network of collaborators which provide collections of pure compounds and complex extracts to be tested as potential antivirals. We have already tested over 2400 repurposing drugs and around 7000 experimental compounds in the SARS-CoV-2 infection cell culture system. Several clinically approved drugs have shown antiviral activity in the absence of toxicity in the cell culture systems and they are being considered as potential candidates for clinical testing by the Global Health PTI at CSIC. Moreover, we have identified new families of experimental compounds and natural extracts with antiviral activity that have been protected by patent applications. We are currently characterising their mode of action and performing preclinical animal studies. Finally, we have performed several R&D contracts with public and private institutions in the antiviral discovery field.

Geographic distribution of the Network of Collaborators that provide chemical compounds and natural extracts for antiviral screening purposes.



Bioimaging platform

One of the priorities of the centre is to strengthen our bioimage capabilities. A bioimaging platform has been recently established to capitalise on the recent acquisition of advanced electron and light microscopy equipment, by launching novel research endeavours that exploit the power of integrative and correlative bioimaging techniques.

Efforts have been carried out to integrate multi-scale and multi-resolution approaches to cover the whole range of resolution from gross anatomy down to single cell, molecular and atomic scales. A strong coordination will be promoted among the **Advanced Light Microscopy** facility (which has recently benefited from the acquisition of state-of-the-art instrumentation that largely expands mesoscopy and functional imaging capabilities), the **Electron Microscopy** facility and the **Cryoelectron Microscopy** facility, the latter offering a wide range of techniques for which it is a pioneer in Spain.

Among others, single particle analysis, cryoelectron tomography, cryocorrelative microscopy (the combined use of cryolight microscopy, cryoscanning electron microscopy and cryotransmission electron microscopy) and very recently, cryoelectron diffraction, a very useful technique for the structural determination of crystalline structures of organic and biological molecules, has been offered to the national and international communities.

A major challenge associated to the bioimaging platform is the need for robust algorithms and user-friendly data analysis pipelines, capable to extract meaningful information from a massive amount of data generated by single molecule, light and electron microscopy imaging experiments in virus, bacteria, plants, animal and human cells. In the case of optical microscopy, and to overcome this bottleneck, a Quantitative **Image Analysis Unit** has been created. In the case of cryoelectron microscopy, the **Instruct Cryoimage Processing** Center (I2PC) and the above mentioned Cryoelectron microscopy are the only Spanish facilities belonging to INSTRUCT, the European network of structural biology facilities. I2PC provides continuous support to data processing and has been involved in the organisation of several practical courses at the international level.

Associated to this bioimaging effort is the development and application of single molecule biophysics techniques. The CNB hosts a good infrastructure and it has been organised as part of the Single Molecule Optical Spectroscopy Unit.

Standard european vector achitecture (SEVA) platform

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The SEVA platform is a web-based resource and a material clone repository to assist the choice of optimal plasmid vectors for de-constructing and re-constructing complex prokaryotic phenotypes based in the SEVA database (SEVA-DV), originally launched in 2013.

The updated SEVA database 4.0 (SEVA-DB 4.0) is a resource for implementation of a standard for physical assembly of vector plasmids and for their non-ambiguous nomenclature as well as the index for a repository of functional sequences and actual constructs available to the community. The database was designed to simplify the choice of a given vector for the sake of specific applications, in such a way the user can easily decide the best configuration of replication origins, antibiotic resistance and business segments.

The SEVA-DB adopts simple design concepts imported from Systems Engineering into vector architecture and development to facilitate the swapping of functional modules and the extension genome engineering options to microorganisms beyond typical Laboratory strains. This platform has been implemented in the Molecular Environmental Microbiology Laboratory (CNB-CSIC).

Since their launching in 2013, the SEVA platform has sent over 3700 plasmids to more than 43 countries.

E Martínez-García, S Fraile, E Algar, T Aparicio, E Velázquez, *et al*. SEVA 4.0: an update of the Standard European Vector Architecture database for advanced analysis and programming of bacterial phenotypes. Nucleic Acids Res 2022, 51, D1558–D1567.

SEVA | Standard European Vector Architecture