Introduction

The PRBB is a large European scientific infrastructure that generates high quality knowledge to decipher the genetic and molecular basis of life and help solve emerging health problems. The park provides a fresh and innovative approach to solving basic and clinical problems in biomedicine by gathering together a critical mass of independent public research centres in an exceptional and spacious building attached to a university hospital. More than 1,400 people from 50 different countries work together on this challenge.

Researchers at the PRBB have access to outstanding and cutting-edge scientific and technical services. With the exception of the PRBB animal facility, all other services are managed by the individual research centres, primarily the CRG, UPF and IMIM. Thanks to a decision made by the PRBB’s scientific committee, the services are offered to the entire scientific community at the park for the same internal fee. In general, the core facilities meet the needs of the critical mass of researchers at the PRBB, as well as providing services to external public and private entities.

The inter-institutional coalition at the park enables scientists working in any of the centres to get support from a large variety of platforms with the latest generation equipment and led by experts in the field. The service units continuously explore new and emerging technologies including for the accurate interpretation and representation of data. Furthermore, most units organise courses and training for scientists to help them become familiar with the technology.

In addition to these shared facilities, most of the centres at the PRBB have further internal services for their researchers. Access to other scientific equipment, services and consulting can be obtained through collaboration with one or more of the 100 plus research groups housed in the park’s different centres. Each day the scientific community of the park strives to be competitive and to incorporate talent from the top centres in Europe and the United States. This has resulted in almost 40% of the current scientific community being from outside Spain. The cooperative model of organisation with common areas facilitates the interrelationships between the centres and the joint advanced scientific and technical services. The animal facility of the park is outstanding and considered one of the most up-to-date in Europe, as are other services at the centres including advanced light microscopy, proteomics and flow cytometry.
Animal Facility (PRBB)

The PRBB animal facility is one of the most complex and robotized installations of its kind in Europe and is fully accredited by AAALAC, the International Association for Assessment and Accreditation of Laboratory Animal Care. This is the maximum international certification and implies an acknowledgment of the quality of the operation of the facility which translates into better practices and research results. The main animal models are zebras, rabbits and axolotls.

The animal facility covers 4,500 m² with six independent units, which are connected and run under a single management. (1) The aquatic animal area (zebra fish and Xenopus). (2) The specific pathogen germ free (SPF) barrier zone for rodents, with modern auto-ventilated microisolators and three support laboratories. (3) A transgenesis area with large laboratories (250 m²) for the production of genetically modified mice. (4) The experimental area with laboratories, surgery rooms and an irradiator. (5) The quarantine area with its own access changing rooms and embryonic transfer re-derivation laboratory. (6) A conventional animal facility, located at an adjacent building, which is connected via a tunnel with the PRBB, and has a surface area of 1,300 m², mainly for studies with animal models in neuropharmacology and immunology.

The Ethics Committee of Animal Experimentation of the PRBB (CEEA-PRBB) has more than 200 different procedures approved. Its main objective is to legally required evaluation of all experimental procedures involving animals, taking into account, when possible, alternative methods to the use of animals.

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MARBiobanc (IMIM)

The biobank of the Parc de Salut Mar (MARBiobanc) is a public, non-for-profit facility which stores various collections of biological samples available to the whole scientific community. It is organized as a technical unit with regards to quality, order and destination. It has restricted access facilities which are equipped with the security control mechanisms necessary to ensure the correct storage of the biological samples, their confidentiality and their traceability in accordance with all the Spanish ethical and legal regulations.

The Biobank Service is certified by AENOR to ISO 9001:2008.

Available human biospecimen collections
- Cryopreserved tumour bank
- Leftover diagnostic tissues
- Haematological malignancies
- Cerebral infarction
- Lung diseases (Lung Biobank Platform)
- Influenza A (H1N1)

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Clinical Research Unit (IMIM)

The Clinical Research Unit has 12 beds and capacity to run different studies at same time. The equipment is especially suitable for phase I clinical trials in drug development, for bioequivalence studies or for nutritional interventions. The studies are performed in accordance with the Good Clinical Practice (GCP) standards. It is accredited by the Government of Catalonia.

The Ethics Committee for Clinical Research (CEC Parc de Salut Mar) evaluates the study protocols in accordance with Spanish and European regulations. The Committee has two regular meetings every month. It is accredited by the Government of Catalonia and the Spanish Medicines Agency.

Available services
- Clinical trials in Phase I and Phase II
- Clinical trials of efficacy and tolerability
- Evaluation of the abuse potential of new drugs
- Neuropsychopharmacology and behavioural pharmacology
- Methodological advice for clinical trial protocols
- Pharmacokinetic studies:
  - Bioavailability, including bioequivalence studies of generics
  - Metabolism and identification of metabolites

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Advanced Light Microscopy Unit (CRG)

This unit aims to provide instruments covering the whole application spectrum of advanced light microscopy. The service includes the use of a number of advanced light microscopy systems, equipment for sample preparation and maintenance prior to imaging and resources for the subsequent processing of the image data. The staff assists researchers in the experimental planning of experiments and provides the in-depth training for the operation of the microscopes and for specific imaging techniques. Support is also provided in the processing, rendering and analysis of the datasets. Custom analysis can be designed.

The equipment of the unit includes 6 confocal microscopes, 2 automated widefield fluorescence microscopes and 1 macro zoom fluorescence microscope. It is currently one of the best equipped microscopy units in Europe.

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Flow Cytometry Unit (CRG/UPF)

This unit provides PRBB researchers with the technical expertise and training to access the state-of-the-art instrumentation, as well as advice to develop reliable flow cytometric assays with the highest quality control standards and productivity. It supports the use of a wide range of flow cytometry applications and new ones are implemented responding to the facility needs or upon user demand.

Equipment

Analysers
- BD FACScan: analog cytometer equipped with 1 laser and 5 detectors
- BD FACScalibur: analog cytometer equipped with 2 lasers and 6 detectors
- BD FACScanito: digital cytometer equipped with 2 lasers and 8 detectors
- BD LSR II: digital cytometer equipped with 4 lasers and 12 detectors
- BD LSRFortessa: digital cytometer equipped with 4 lasers and 16 detectors

Available services
- Support in project/assay development to perform proper flow cytometry experiments
- Cell sorting:
  - BD FACSAria II SORP: digital cytometer equipped with 5 lasers and 20 detectors
  - BD Influx: analog cytometer equipped with 5 lasers and 16 detectors

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### Genomics Unit (CRG)

The scope of the CRG Genomics Unit is to provide excellent, state-of-the-art services in the fields of microarray technology and next-generation sequencing. Furthermore, the unit is dedicated to test, implement, and to develop new protocols (wet lab and bioinformatics) to advance in the analysis of genes and genomes.

#### Second generation sequencing

The unit has two second-generation sequencers. The Illumina HiSeq2000 generates 2 billion reads per run (read length of up to 100 nt). The Roche 454 FLX+ sequencer generates smaller data sets but with a longer than 500 bp. The combination of both technologies enables the unit to offer a wide portfolio of sequencing applications, ranging from either DNA or RNA samples.

#### Applications include
- Genomic de novo sequencing and re-sequencing
- Exome capture
- Chip-seq
- Amplion sequencing
- Transcriptome analysis (mRNA, small RNA, miRNA)

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### Molecular Cytogenetics Platform (IMIM-HMar)

The Molecular Cytogenetics Platform is a comprehensive service which includes several cytogenetic analysis techniques. These methods are very useful within the field of translational research for characterising genetic alterations both in humans and mice.

It uses conventional G-banding cytogenetic techniques, fluorescence in situ hybridization methods (FISH), spectral karyotyping (SKY) and genomic microarray techniques by means of GeneChip array hybridisation (SAM Affymetrix platform).

The facility, except for the microarray service, is located in the Molecular Cytogenetics Laboratory of the Pathology Service at the Hospital del Mar.

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### Proteomics Unit (CRG/UPF)

The CRG/UPF Proteomics Unit is an innovative core facility that offers proteomics methods to the scientific community. As a reference centre, the unit is one of the best-equipped in Europe, with several high-performance liquid chromatography and electrophoresis systems, and three advanced mass spectrometers. Specifically, the unit currently has two LTQ-Orbitrap mass spectrometers, a Q-Trap mass spectrometer, three nanoLC-HPLC, and a microLC-HPLC. The available instruments cover the most advanced techniques of the proteomics field, and are accessible to national and international scientists.

The unit is part of the EU Meril initiative and of Prime-XS, prestigious international consortia that grant access to state-of-the-art technology to the European research community.

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### Peptide synthesis (UPF)

This service is offered by the proteomics and protein chemistry unit at the UPF.

**Applications include**
- Custom peptide synthesis (up to 30 residues; 60-70 residues also considered)
- Oxidation/folding of multiple disulphide small proteins/domains
- Purification to various purity specs (70, 90, 95, 98%)

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### Screening & Protein Technologies (CRG)

The BMSJPT unit performs protein production and automated processes in the context of biomolecular and biochemical screening assays. The Unit is equipped with a human whole genome siRNA library, as well as three chemical compound libraries.

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### Microarray Analysis Service – SAM (IMIM)

The Microarray Analysis Service (SAM), with the AffymetrixGeneChip® research and diagnostics platform, offers an integrated service for cytogenetic, genomic and transcriptomic studies.

The experimental services offered are the sample quality, quantification and microarray processing. Experimental design consultancy, statistical data analysis and orientation to its biological interpretation with specific tools are also included. Arrays of human, mouse and other species are available.

**Applications include**
- Biomarker discovery
- Gene/mRNA expression profile studies
- Alternative splicing
- miRNA detection
- Cytogenetics, CNVs and SNPs studies

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### Genomics Core Facility (UPF)

Next-generation sequencing (NGS) is becoming the reference of medical genomics. Our two next-generation sequencers, MiSeq (Illumina) and GS Junior (454 Roche), fulfill small-scale NGS project needs. We also offer Sanger sequencing and small/mid-sized throughput real-time PCR services, among others.

**Applications include**
- Small genome de novo sequencing
- Targeted resequencing
- ChiP-seq and small RNA-seq
- Structural variation analysis
- Targeted transcriptomics and metagenomics
- Ancient DNA sequencing
- Small/mid-scale genotyping, gene expression, microRNA and digital PCR

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### Equipment
- AffymetrixGeneChip® System: Research platform (GCS8000 and diagnostics platform (GCS9000, x2))
- GeneChip® Oven 645
- GeneChip® Fluidics Station 450
- GeneChip® Scanner 3000 7G
- Bioanalyzer 2100 (Agilent Technologies)
- Nanodrop Spectrophotometer ND-1000 (Nanodrop Technologies)

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### Microarrays
- GeneChip® Scanner 3000 7G
- GeneChip® 8x6C
- Microarray, 8x6, 24x4, 384
- Flowcell, GeneChip, 1520, 2100
- Qubit fluorometer
- Illumina 3000/5000
- Customise Affymetrix arrays
- Bioanalyzer, NanoDrop

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### Services include
- Custom peptide synthesis
- Phospho-peptide enrichment
- Different methods of protein quantification in complex mixtures including label-free strategies
- Selected reaction monitoring assay development
- Protein quantification
- Plasma depleton (IgG+Ab, Top20)
- Molecular weight determination
- Mass spectrometric data analysis and interpretation
- Protein identification by nLC-MS/MS
- Identification of post-translational protein modifications
- Purification to various purity specs (70, 90, 95, 98%)

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### Equipment
- LightCycler480
- 7 array hybridisation ovens, 2100 Bioanalyzer, NanoDrop
- Sample quality control: Agilent
- FLX+ sequencing with specific tools are also included.

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### Transcriptome analysis (mRNA, small RNA, miRNA)
- Sanger sequencing and Fragment analysis (ABI 3730xl and ABI 3130xl)
- DNA, cDNA and RNA quantification and quality assessment (Agilent Bioanalyzer, Picogreen)
- Robotic procedures for DNA normalisation or PCR or sequence clean-up (Beckam Biomek FX and Biomek NX)

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Bioinformatics Service (CRG)

The Bioinformatics Core Facility aims to provide researchers at PRBB and other external institutions with services of consultation, data analysis and management, software development, and access to computing resources.

Basic services
- Consultation on bioinformatics methods and resources
- Software evaluation, implementation, and training
- Customization of bioinformatics resources

Advanced services
- High-throughput data analysis of genomics, transcriptomics, and proteomics datasets
- Downstream analysis for the interpretation of gene lists
- Identification of functional genomics elements
- Construction of ad-hoc databases and web interfaces
- Development of bioinformatics scripts for sequence analyses and genome annotation tasks

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Bioanalytical Services (IMIM)

The Analytical Services and the Anti-Doping Laboratories are ENAC ISO 17025, WADA and AORC accredited technological platforms that use liquid and gas chromatography coupled to different kinds of mass spectrometry, immunological analyses, surface plasmon resonance and analytical information network management.

Services include
- Doping control in humans and animals
- Analysis of biological fluids
- Laboratory Management System (LIMS)
- Pharmacokinetics and drug metabolism

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IMIM, Hospital del Mar Medical Research Institute
CEXS-UPF, Department of Experimental and Health Sciences of the UPF
CMRB, Centre for Genomic Regulation
CREAL, Centre for Research in Environmental Epidemiology
FPM, Pasqual Maragall Foundation
IBE (CSIC-UPF), Institute of Evolutionary Biology

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Consultancy in environmental health (CREAL)

Researchers at CREAL provide consulting services and technical assistance to public administrations and private companies in environmental health issues directly related to their research experience. They carry out studies or reports of potential hazards and/or public health recommendations.

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www.creal.cat

Patient-Reported Outcome Measures (IMIM)

BibliOPRO is a free-access online scientific library of Patient-Reported Outcomes (PROs) in Spanish with detailed information on more than 700 measures. 25% of them, including the SF-12 and the SF family, can be directly accessed from this site. The service promotes the adequate use and interpretation of PROs for clinical, epidemiological and public health research and practice. The Scientific Committee has developed an instrument for evaluating the validity and quality of these measures (EMPRO).

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Software

Several centres at the PRBB offer freeware or software licenses in their respective homepages. The following QR codes will lead you to the offers.

- Software from the research program on Biomedical Informatics (GRIB)
- Freeware from the Hospital del Mar Medical Research Institute (IMIM)
- Software licenses from the Centre of Genomic Regulation (CRG)
- Software from Bioinformatics at the CRG
- Software from the Research Centre of Environmental Epidemiology (CREAL)

Software from the research program on Biomedical Informatics (GRIB)
Software from the Hospital del Mar Medical Research Institute (IMIM)
Software licenses from the Centre of Genomic Regulation (CRG)
Software from Bioinformatics at the CRG
Software from the Research Centre of Environmental Epidemiology (CREAL)