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Formative and professional positions

High school Period:

SANTA ANA HIGH SCHOOL (California, USA).
- Attendance to the senior course within an international exchange program (from September 1985 to August 1986)

INSTITUT OF PROFESIONAL FORMATION GUINEUETA. Barcelona.
- Clinical analysis course with an European Fundation Fellowship. (1991-1992)

University Studies Period:

UNIVERSITY OF GÖTTINGEN (Germany)
- Stay with an **ERASMUS fellowship** in the laboratories of the Institute of Biochemistry (with Professor R. Zimmermann) and the Institute of Molecular Genetics (with Professor J. Fritz) of the University of Göttingen. (From August of 1993 to August of 1994).

UNIVERSITY OF BARCELONA. Barcelona,
- **Graduated in Biology.** Orientation to Biochemistry and Molecular Biology. (1994)

PhD Period:

UNIVERSITY OF BARCELONA. Barcelona, from Sept. 1994 to Feb. 2000.
Ph.D. in Molecular Biology. Dep.of Biochem. & Mol. Biol.
Supervisor: Professor Manuel Palacín.
Thesis title: "Identification of the light subunit of heteromeric amino acid transporter (LSHAT) family. y^+LAT-1 causes Lysinuric Protein Intolerance (LPI)".
Highest qualifications and **PhD extraordinary prize,** University of Barcelona (2000).

UNIVERSITY OF GIESSEN (Germany).
Pre-doctoral stay in the Laboratory of the Institute of Nutrition (with Professor H. Danniel). (Two months in 1998)

Post-Doc Period:

EUROPEAN MOLECULAR BIOLOGY LABORATORY (EMBL).
(Heidelberg. March 2000 – February 2006)
Post-Doc in the group of Dr. Peer Bork,
From 2000 to 2002 financed through a European Molecular Biology Organization (**EMBO**) **long-term fellowship**.
From 2002 to 2004 with different contracts linked to different projects.
From 2004 to 2006 as an EMBL Staff (grade 7)
Main Projects: Analysis of gene evolution of Metazoa. Identification and classification of pseudogenes in mammals. Primary Genome sequence annotation.

Principal Investigator Period:

ICREA Research Professor at the Barcelona Supercomputing Center (BSC-CNS),
(February 2006 -)
Principal investigator of the Computational Genomics Group at the Department of Life Sciences, Barcelona Supercomputing Center- Centro Nacional de Supercomputación (BSC-CNS)
IP and coordinator at the BSC of the PanCancer ICGC-TCGA project (2013).

Vice-president of the Bioinformatics Barcelona (https://www.bioinformaticsbarcelona.eu/)

Research trajectory

Summary

My scientific career started when I finished the bachelor in Biology (Biocehmistry, Molecular Biology and Genetics) at the University of Barcelona (1994). The first contact with research projects was as Erasmus student at the University of Göttingen in 1994. During that stay, I was in two laboratories working in Molecular Genetics and Biochemistry. Afterwards, I started my PhD in the Manuel Palacin's lab (UB) to study the molecular and biochemical aspects of the amino acid transport under the framework of an FPI fellowship. After five years, I finished the PhD identifying a new amino acid transporter family related to aminoaciduria (see publications between 1998 and 2000). A part of the molecular biology and genetics technics, I also used bioinformatics tools. In 2000, I started my bioinformatics career by joining Dr. Bork group in the EMBL (Heidelberg) by getting an EMBO long-term postdoctoral fellowship. During almost seven years at EMBL I was directly involved in the annotation of genes of the first big eukaryotic genomes sequenced, as well as in the identification and characterization of genetic duplications and pseudogenes, as part of different sequencing and genome analysis consortiums (see publications between 2002 and 2007).

In 2006, I joined the BSC through an "ICREA Research Professor" position. I was awarded with my first National Project from MICINN (BIO2006-15036) as PI, and I started my own group in the BSC doing metagenomics studies as well as annotations of regulating regions in eukaryotic genomes. The participation as PI in another two FP7 projects (MetaHit and MITIN), allowed me to constitute a stable group and to impulse two research lines: (i) studies related to genomics and systems biology; and (ii) genetic variability associated to complex diseases and human gut metagenomics. In parallel, I also pushed other collaborations in the framework of genome annotations, specifically of regulatory regions, where we developed our own tools (ReLA). This led us to participate later in three consortiums funded by the EC, BLUEPRINT and PROCOGEN in the FP7 and T2DSystems in H2020.

Starting in the context of the ICGC consortium, we contributed over the last years to the genomic study of the CLL (Chronic Lymphocytic Leukemia) genome, by developing and applying SMUFIN, a tool, able to characterize with high detail complex karyotypes associated to aggressive tumors. At the same time, I coordinated the implication of the BSC in the ICGC-PanCancer, as one of the analysis centers, with the objective of studying the complete genome of more nearly 3000 tumors. This research activity has pointed the BSC, as one of the reference centers for the analysis of genomes in biomedicine and, in particular, genomic oncology and its implantation into health care systems, setting up the basis for a personalized medicine. From this activity, we further applied our expertise and methodology to analyze cancer genomes in different contexts. One of these analyses, expands the analysis to other type of DNA, circular DNA, that have a role in the progression of the Neuroblastoma tumor. We are currently applying more sophisticated computational and mathematical models to capture more layers of complexity around disease genomes. These integrative and artificial intelligence-based models can identify more subtle correlations, including with clinical value for prognosis, diagnosis and treatment.

Finally, the group is also coordinating the generation of infrastructures for the management and analysis of genomic data in a Personalized Medicine context. We are coordinators of a project EUCANCan that aims at implementing a interoperative infrastructure across different personalized medicine nodes (see www.eucancan.com). This activity, together with other regional initiatives for Personalized Medicine, and our implication within the Global Alliance for Genomics and Health, sets our group as one of the reference groups pushing forward genomic biomedical research internationally.

Publications

Some author lists are collapsed for formatting reasons.
Only publications with a direct contribution are included

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- Quintana I, Terradas M, Mur P, Te Paske IBAW, Peters S, Spier I, Steinke-Lange V, Maestro C, **Torrents D**, Puiggròs M, Royo R, Tonda R, Parra G, Piscia D, Beltrán S, Navarro M, Piñol V, Brunet J, Gonzalez-Abuin N, Aiza G, Sommer A, van Herwaarden Y, Astuti G, Holinski-Feder E, Hoogerbrugge N, de Voer RM, Aretz S, Capellá G, Valle L.
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PMID: 35953718

- Valls-Margarit J*, Galván-Femenía I*, Matías-Sánchez D*, Blay N, Puiggròs M, Carreras A, Salvoro C, Cortés B, Amela R, Farre X, Lerga-Jaso J, Puig M, Sánchez-Herrero JF, Moreno V, Perucho M, Sumoy L, Armengol L, Delaneau O, Cáceres M, de Cid R*, **Torrents D***.
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Clustering and graph mining techniques for classification of complex structural variations in cancer genomes.
Sci Rep. 2022 Feb 28;12(1):3244. doi: 10.1038/s41598-022-07211-6.
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- COVID-19 Host Genetics Initiative (Includes **D. Torrents**).
Mapping the human genetic architecture of COVID-19.
Nature. 2021 Dec;600(7889):472-477. doi: 10.1038/s41586-021-03767-x. Epub 2021 Jul 8.
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Patents

- A computer-implemented and reference-free method for identifying variants in nucleic acid sequences (EP16178577.9)
Registered: May 2016
Inventors: David Torrents, David Carrera, Mercè Planes, Jordà Polo.

Selected Research Grants

- **Project title:** GENOME RE-MODELLING IN EVOLUTION: FUNCTIONAL ANNOTATION OF TANDEM GENE DUPLICATIONS IN DROSOPHILA AND OTHER INVERTEBRATES
Agency: Fundación BBVA.
Principal Investigator: Miguel Manzanares (CSIC, Madrid)
Duration: from 2004 to 2007

- **Project title:** ESTUDIOS A GRAN ESCALA Y EN DETALLE DE LAS ESTRATEGIAS Y MECANISMOS RESPONSABLES DE LA EVOLUCIÓN GÉNICA EN VERTEBRADOS Y SU IMPLICACIÓN EN LA GENERACIÓN DE DIVERSIDAD BIOLÓGICA (BIO2006-15036).
Agency: Plan Nacional I+D+i, Ministerio de Educación y Ciencia.
Principal Investigator: David Torrents Arenales
Duration: from 01/10/2006 to 30/09/2009

- **Project title**: INTEGRATION OF THE SYSTEMS MODELS OF MITOCHONDRIAL FUNCTIONA AND INSULIN SIGNALLING, AND ITS APPLICATION IN THE STUDY OF COMPLEX DISEASES (MITIN, HEALTH-F4-2008-223450).
Agency: European 7th Framework Programme
Partner: WP1 leader, David Torrents Arenales (coordinator: Antonio Zorzano, IRB)
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- **Project title:** METAGENOMICS OF THE HUMAN INTESTINAL TRACT (METAHIT, HEALTH-F4- 2007-201052).
Agency: European 7th Framework Programme
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Duration: from 1/1/2008 to 1/1/2012

- **Project title:** A *BLUEPRINT* OF HAEMATOPOIETIC EPIGENOMES (BLUEPRINT) (HEALTH.2011.2.1.1-1 – FP7 FP7-KBBE-2011-5)
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- **Project title:** UNDERSTANDING OF THE CONIFER GENOME (ProCoGen) (FP7-KBBE-2011-5: 289841)
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Coordinator: Carmen Diaz-Sala
Duration: from 1/1/2011 to 1/1/2015

- **Project title:** SYSTEMS BIOLOGY ANALYSIS OF IMMUNE TOLERANCE IN ORGAN TRANSPLANTATION
Agency: Fundació Marató TV3
Coordinator: Juanjo Lozano
Duration: from 1/1/2013 to 31/12/2015

- **Project title:** IDENTIFICACION Y CARACTERIZACION DE REORDENAMIENTOS CROMOSOMICOS COMPLEJOS EN MULTIPLES GENOMAS DE DIFERENTES TIPOS DE TUMOR. (SAF2014-60293-R)
Agency: Plan Nacional, Ministerio de Economía y Competitividad.
Duration: from Jan 2014 to Dec 2017

- **Project title:** SMUFIN
Agency: Caixaimpulse. La Caixa
Coordinator: David Torrents
Duration: from 1/1/2015 to 1/1/2018

- **Project title:** FUNCTIONAL AND CLINICAL IMPACT OF GENOMIC ANALYSIS IN CLL (PMP15/00007). PerMed.
Agency: Instituto de Salud Carlos III (ISCIII)
Coordinator: Elias Campo (IDIBAPS, Barcelona)
Duration: from Jan 2016 to Dec 2019

- **Project title:** DEVELOPMENT OF A SYSTEMS BIOMEDICINE APPROACH FOR RISK IDENTIFICATION, PREVENTION AND TREATMENT OF TYPE 2 DIABETES (667191-2); T2DSystem
Agency: Horizon 2020-PHC-2015
Coordinator: Miriam Cnop
Duration: from 1/1/2016 to 1/1/2019

- **Project title:** TransTumVar: BEYOND THE IDENTIFICATION AND CLASSIFICATION OF STRUCTURAL VARIATION ACROSS DIFFERENT TUMORS: NEW APPROACHES AND TRANSLATION INTO THE CLINICS
Agency: Ministerio de Economía y Competitividad
Coordinator: David Torrents
Duration: from 1/1/2018 to 31/12/2021

- **Project title:** CLLEvolution: GENOMIC AND EPIGENOMIC DRIVERS OF DISEASE EVOLUTION IN CHRONIC LYMPHOCYTIC LEUKEMIA. TARGETS FOR CLINICAL INTERVENTION
Agency: La CAIXA-Recercaixa, Projectes de Salut
Coordinator: Elias Campo
Duration: from 1/1/2019 to 31/12/2021

- **Project title:** EUCANCan; A FEDERATED NETWORK OF ALIGNED AND INTEROPERABLE INFRASTRUCTURES FOR THE HOMOGENEOUS ANALYSIS AND SHARING OF CANCER GENOMICS DATA.
Agency: Horizon 2020- SC1-BHC-2018-2020
Coordinator: David Torrents
Duration: from 1/1/2019 to 31/12/2022

- **Project title:** PLATAFORMA PARA LA EVALUACION DEL ANALISIS GENOMICO DE LA VARIACION ESTRUCTURAL Y SU APLICACION A CANCER Y A TEJIDOS NEURONALES SANOS.
Agency: Agencia Estatal. Plan nacional.
Coordinator: David Torrents
Duration: from 1/9/2021 to 01/09/2024

Teaching **(examples, not up to date)**

Master in Biomedicine, Bioinformatics and Genomics (University of Barcelona, 2006-to present)
Molecular Evolution Course (University of Barcelona)
Phylogeny and genealogy course (University of Barcelona)
Advanced bioinformatics, Biotechnology studies (University of Vic)
Comparative Genomics (University of Barcelona)
Bioinf. approaches in Biomedical Res. (Oncological Institute, IDIBELL)

Directed Thesis

PhD Student: Leyden Fernandez
Title: "THE ROLE OF GENOMIC REGULATORY REGIONS IN THE ADAPTATION OF PROKARYOTES TO ENVIRONMENTAL FACTORS"
Organism: Universitat de Barcelona (UB)
Year: 2015

PhD Student: Santiago Gonzalez Rosado
Title: "IDENTIFICATION AND CHARACTERIZATION OF NON-CODING GENOMIC VARIATIONS ASSOCIATED TO CANCER DISEASE**"**
Organism: University of Barcelona, Biomedicine.
Year: 2016

PhD Student: Sílvia Bonàs
Title: "IMPLEMENTATION OF A NOVEL ANALYTICAL FRAMEWORK FOR LARGE-SCALE GENETIC DATA. EXTENDING THE GENETIC ARCHITECTURE OF TYPE 2 DIABETES BEYOND COMMON VARIANTS"
Organism: University of Barcelona, Biomedicine
Year: 2017

PhD Student: Marta Guindo
Title: "A SYSTEMATIC AND COMPREHENSIVE APPROACH FOR LARGE GENOME-WIDE ASSOCIATION STUDIES"
Organism: University of Barcelona, Biomedicine
Year: 2019

PhD Student: Elias Rodriguez
Title: "STUDY OF COMPLEX CHROMOSOMAL REARRANGEMENTS IN CANCER. THE ROLE OF EXTRACHROMOSOMAL CIRCULAR DNA AS A GENOME REMODELER IN NEUROBLASTOMA
Organism UNIVERSITY OF BARCELONA, BIOMEDICINE
Year: 2020

PhD Student: Mercè Planas
Title: "DETECTION AND CLASSIFICATION OF SOMATIC STRUCTURAL VARIANTS, AND ITS APPLICATION IN THE STUDY OF NEURAL DEVELOPMENT"
Organism: UNIVERSITY OF BARCELONA, BIOMEDICINE
Year: 2020

PhD Student: Jordi Valls
Title: "COMPREHENSIVE IDENTIFICATION AND CHARACTERIZATION OF GERMLINE STRUCTURAL VARIATION WITHIN THE IBERIAN POPULATION"
Organism: UNIVERSITY OF BARCELONA, BIOMEDICINE
Year: 2021

PhD Student: Luisa Delgado
Title: IDENTIFICATION AND CHARACTERIZATION OF NEW COMPLEX PATTERNS OF STRUCTURAL DNA AND RNA ALTERATIONS IN CANCER.
Organism: UNIVERSITY OF BARCELONA, BIOMEDICINE
Year: 2021

PhD Student: Lorena Alonso
Title: FROM THE DISCOVERY OF EPISTATIC EVENTS IN TYPE 2 DIABETES MELLITUS TO THE STUDY OF RELATED GENE EXPRESSION REGULATORY VARIATION.
Organism: UNIVERSITY OF BARCELONA, BIOMEDICINE
Year: 2023

PhD Student: Romina Royo
Title: DEVELOPMENT AND APPLICATION OF METHODOLOGIES AND INFRASTRUCTURES FOR CANCER GENOME ANALYSIS WITHIN PERSONALIZED MEDICINE.
Organism: UNIVERSITY OF BARCELONA, BIOMEDICINE
Year: 2023

David Torrents Arenales, PhD.