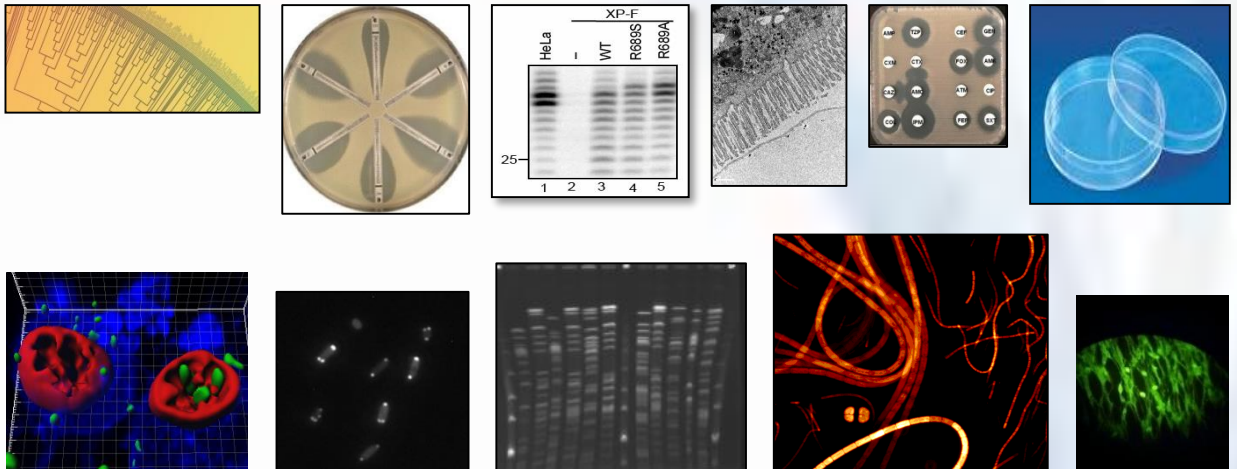

Department of Genetics and Microbiology Universitat Autònoma de Barcelona



2020 ANNUAL SCIENTIFIC REPORT



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Introducció / Introduction



L'any 2020 ha estat ben marcat per l'impacte del virus SARS-CoV-2 en les nostres vides. A nivell professional ha significat un gran esforç per mantenir la docència a un bon nivell, tot adaptant-nos a una activitat docent íntegrament telemàtica i, semipresencial, quan ha estat possible. A nivell de recerca, el tancament dels laboratoris durant més de dos mesos ens ha obligat també a adaptar-nos i a ser més creatius per continuar amb la nostra activitat investigadora. Malgrat això, o potser degut a tot això, en l'any 2020 la productivitat científica del Departament, mesurada en quantitat i qualitat de publicacions, ha sofert un salt qualitatiu, similar al que va ocórrer l'any 2014. Així, hi ha hagut un increment d'unes 100 publicacions respecte el 2019. El factor d'impacte mitjà ha augmentat en un punt, passant de 4,39 (any 2019) a 5,41 (any 2020). També ha augmentat significativament el factor d'impacte del 10% superior de les nostres publicacions: 12,92 i 18,35 en els anys 2019 i 2020, respectivament. En canvi, el nombre de tesis llegendes ha continuat disminuint, notant-se probablement l'efecte pandèmia.

Pel que fa a la capacitat de captació de recursos per recerca, l'any 2020 ha estat l'any de la davallada, seguint la tendència habitual d'aquest paràmetre en el nostre Departament. De fet, aquesta davallada era esperable en el 2019, però sorprenentment l'any passat es va mantenir l'ingrés de recursos. A més, és probable que en la davallada també hi hagi un efecte pandèmia, sobre tot pel que fa a recursos no competitius.

Aquest any serà especialment recordat per tots nosaltres per la pèrdua de la nostra estimada Isabel Esteve. Coneixent-la estic segura que ella us diria: No ploreu, sabeu que mai m'han agradat les llàgrimes! Seguiu. Aneu sempre ben lluny!

Us torno a dir el mateix que l'any passat. Podem doncs sentir-nos orgullosos de la recerca del nostre Departament. Enhorabona a tots i moltes gràcies per fer possible l'alt nivell d'excel·lència del Departament.

The year 2020 has been marked by the impact of the SARS-CoV-2 virus on our lives. At a professional level, it has meant a great effort to maintain teaching at a good level, adapting our teaching activity to an online format. At the research level, the closure of laboratories for more than two months has also forced us to adapt, and to be more creative to continue our research activity. Despite this, or perhaps due to all of this, in 2020 the scientific productivity of the Department, measured in quantity and quality of publications, has undergone a quantitative and qualitative leap, similar to what happened in 2014. Thus, there has been an increase of about 100 publications compared to 2019. The average impact factor has increased by one point, from 4.39 (2019) to 5.41 (2020). The impact factor of the top 10% of our publications has also increased significantly: 12.92 and 18.35 in 2019 and 2020, respectively. However, the number of PhD has continued to decline, in part as a consequence of the pandemic. In terms of the capacity to attract resources for research, 2020 has been the year of decline, following the usual trend of this parameter in our Department. In fact, this decline was expected in 2019, but surprisingly last year the inflow of resources was maintained. In addition, there is likely to be a pandemic effect on the decline, especially in terms of non-competitive resources.

This year will be especially remembered by all of us for the loss of our beloved Isabel Esteve. Knowing her I'm sure she would tell us, "Please, don't cry, you know I've never liked tears. Keep going. Always far ahead!!

I'll tell you the same thing as last year. We can be proud of the research of our Department. Congratulations to all. Thank you for making possible the high level of excellence in our Department.

Prof. Montserrat Llagostera i Casas

Directora del Departament

The activity of DGM is fully committed to participate in the unprecedented intellectual adventure of Biology in the XXI century. We work hard to (i) contribute with our ability and commitment to scientific excellence in the research areas of Genetics and Microbiology; (ii) provide quality teaching and education to our students, future researchers, teachers and professionals in these areas; and (iii) contribute to increase the wellbeing of our society through the practical application of our expertise in biomedicine and other industrial sectors such as biotechnology, food, pharmacy and environment, among others

<http://www.uab.cat/departament/genetica-microbiologia/>

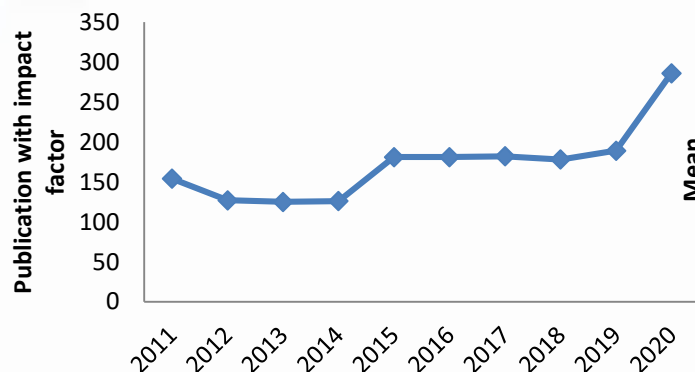
Analysis of Scientific Production (2020)



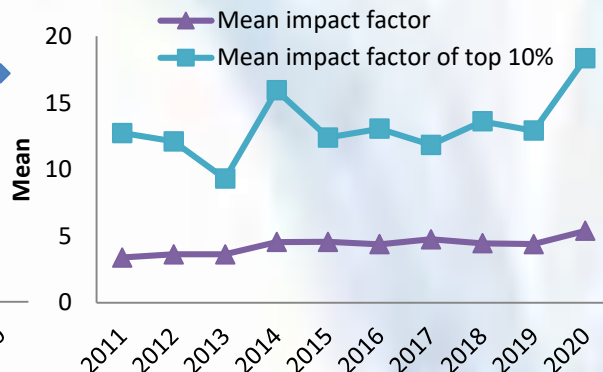
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Number of publication with impact factor	154	127	125	126	181	181	182	178	189	290
Total impact factor	521,38	460,76	454,33	569,71	826,80	793,69	866,43	793,46	830,20	1.568,94
Mean impact factor	3,39	3,63	3,63	4,55	4,57	4,38	4,76	4,46	4,39	5,41
Mean impact factor of top 10%	12,73	12,11	9,31	15,94	12,39	13,06	11,84	13,61	12,92	18,35
PhD thesis defended	20	17	17	12	24	24	15	19	15	12
Competitive income (grants) in euros	781.163	962.260	382.874	931.469	133.100	1.054.491	33.960	1.209.899	1.284.557	112.796
Non-competitive income in euros	184.065	247.820	84.358	80.198	357.958	199.611	27.788	167.579	197.418	72.153
Total income in euros	965.229	1.210.081	467.232	1.011.667	491.058	1.254.102	61.748	1.377.478	1.481.975	184.949

NOTA: En aquesta taula no està inclòs el finançament tant públic com privat obtingut pels grups de recerca dels hospitals universitaris i els adscrits al institut de Biotecnologia i Biomedicina

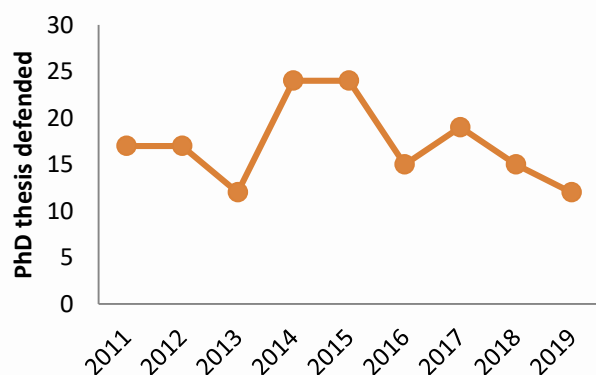
Number of indexed publications



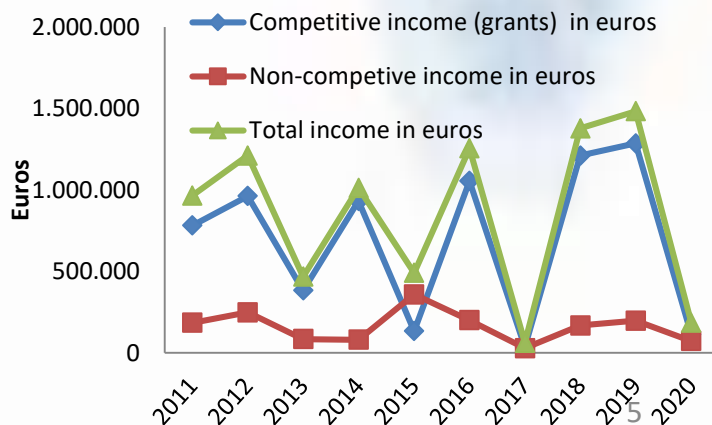
Impact Factors (SCI)



Number of PhD Thesis



Financial research incomes



Research Groups Performance

2020



Bacterial Pathogenesis and Antimicrobials Group

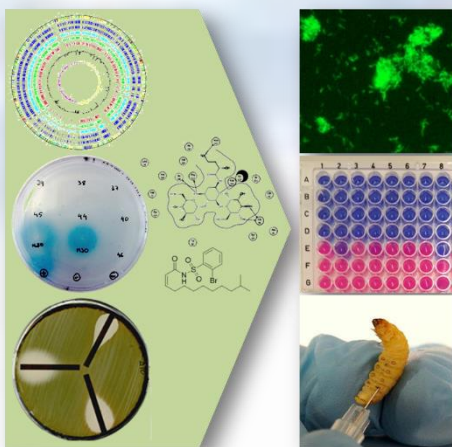
Members

Dr. Isidre Gibert
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Dr. Daniel Yero
Dr. Pol Huedo
Dra. Celeste Gómez
Oscar Conchillo
Xavier Coves
Marc Bravo
Sònia Martínez-Servat
Laia Vulart



Research

The group's research lines fall within the field of bacterial pathogenesis and antimicrobial resistance (**PatoBAnt**). Our research have been focused on the study of virulence and resistance determinants in different human pathogens such as *Stenotrophomonas maltophilia*, *Pseudomonas aeruginosa*, *Burkholderia* sp., *Acinetobacter baumannii*, *Staphylococcus aureus* and *Mycobacterium tuberculosis* among others. We try to unveil the genomic and molecular bases, from a genetic and functional point of view, of processes involved in pathogenesis, virulence and drug resistance. In recent years we have focused much of our efforts on *S. maltophilia*, as a model of an emerging nosocomial MDR microorganism. Thus, we aim to deepen the functional knowledge of its pathogenesis processes and exploit this knowledge to identify new targets for the development of novel drugs or alternative strategies to current treatments. In particular, we focus on the study of non-essential physiological processes such as the *quorum sensing* system and regulatory elements of gene expression as intrinsic determinants of virulence and resistance. The design of drugs against non-essential processes circumvents the selection of resistant strains and is therefore expected to result in a decrease in resistance development. In collaboration with other groups, we apply a multidisciplinary approach, ranging from classical microbiology and bacterial molecular genetics to genomics, proteomics, and bioinformatics that should end with a selection of validated targets and drugs to suppress bacterial virulence and/or resistance phenotypes.



Currently research lines:

- Molecular and genomic bases of bacterial pathogenesis and antimicrobial agent resistance.
- Quorum sensing signal-response systems in *Stenotrophomonas maltophilia*.
- Study of the mechanisms of resistance to colistin in Gram-negative bacteria.
- Validation of novel hit compounds as potential antibacterial drugs against Gram-negative pathogens.

Research projects

- Quorum sensing regulatory networks in *Stenotrophomonas maltophilia* as targets for therapeutic alternatives to current antibiotics. MINISTERIO DE CIENCIA, INNOVACIÓN y UNIVERSIDADES. (Ref.: PID2019-111364RB-I00); 01/06/20-01/06/24

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- Gröschel MI, Meehan CJ, Barilar I, Diricks M, Gonzaga A, Steglich M, Conchillo-Solé O, Scherer I-C, Mamat U, Luz CF, De Bruyne K, Utpatel C, Yero D, Gibert I, Daura X, Kampmeier S, Rahman NA, Kresken M, van der Werf TS, Alio I, Streit WR, Zhou K, Schwartz T, Rossen JWA, Farhat MR, Schaible UE, Nübel U, Rupp J, Steinmann J, Niemann S, Kohl TA. 2020. The phylogenetic landscape and nosocomial spread of the multidrug-resistant opportunist *Stenotrophomonas maltophilia*. Nat Commun 11:2044. (IF: 12.121 // Q1)
- Alio I, Gudzuhn M, Pérez García P, Danso D, Schoelmerich MC, Mamat U, Schaible UE, Steinmann J, Yero D, Gibert I, Kohl TA, Niemann S, Gröschel MI, Haerdter J, Hackl T, Vollstedt C, Bömeke M, Egelkamp R, Daniel R, Poehlein A, Streit WR. 2020. Phenotypic and Transcriptomic Analyses of Seven Clinical *Stenotrophomonas maltophilia* Isolates Identify a Small Set of Shared and Commonly Regulated Genes Involved in the Biofilm Lifestyle. Appl Environ Microbiol 86. (IF: 4.016 // Q1)
- Yero D, Huedo P, Conchillo-Solé O, Martínez-Servat S, Mamat U, Coves X, Llanas F, Roca I, Vila J, Schaible UE, Daura X, Gibert I. 2020. Genetic Variants of the DSF Quorum Sensing System in *Stenotrophomonas maltophilia* Influence Virulence and Resistance Phenotypes Among Genotypically Diverse Clinical Isolates. Front Microbiol 11:1160. (IF: 4.236 // Q1)
- Gómez A-C, Rodríguez-Fernández P, Villar-Hernández R, Gibert I, Muriel-Moreno B, Lacoma A, Prat-Aymerich C, Domínguez J. 2020. E-cigarettes: Effects in phagocytosis and cytokines response against *Mycobacterium tuberculosis*. PloSOne 15:e0228919. (IF: 2.74 // Q2)

Members

Dr. Antonio Villaverde (PI)

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Dra. Laura Sánchez
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Paula Herrero
Victor Campo
Hèctor López
Esther Martínez
Eric Voltà
Aida Carreño
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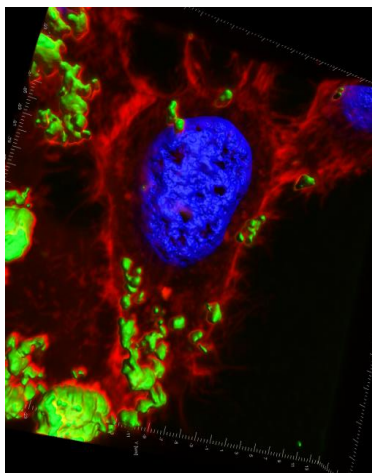
Basic and Applied Microbiology Group



Web: https://ibb.uab.cat/wp-content/themes/viral/modules/ibb_membres/view_grup.php?CodiGrup=33
<https://sites.google.com/view/mycobacteriaresearchlabuab/publications>

Research

We generate nanostructured protein materials for biomedical applications, for which we exploit diverse prokaryotic and eukaryotic cell factories. These engineered polypeptides are the basis for the design of smart functional materials displaying mechanical stability, regular geometry and properties such as specific cell binding, receptor-mediated internalization, intracellular trafficking and drug delivery. Most of our current collaborative projects are devoted to nanosized drugs for the treatment of diverse cancers and infectious diseases, and in regenerative medicine and enzyme replacement therapies. We are also working in two research lines in the mycobacteriology field. The first one is focused on the study of the role of the lipids of the mycobacteria cell wall as virulence factors in non-tuberculous mycobacteria that are opportunistic pathogens such as *M. abscessus*. We work to understand the cording phenomenon showed by many pathogenic mycobacteria. The second line is focused on the role of mycobacteria as immunotherapeutic agents for cancer treatment. The main aim is to understand the immunomodulatory and antitumor capacity of different species of non-pathogenic mycobacteria and BCG, both in the treatment and prevention of bladder cancer progression and in other types of cancers.



Publications 2020

2019 Impact factors (IF) are indicated when it applies.

- ✓ Julieta M. Sánchez, Héctor López-Laguna, Patricia Álamo, Naroa Serna, Alejandro Sánchez-Chardi, Verónica Nolan, Olivia Cano-Garrido, Isolda Casanova, Ugutz Unzueta, Esther Vazquez, Ramon Mangues and Antonio Villaverde. 2020. Artificial inclusion bodies for clinical development. *Advanced Science*, 7: 1902420. IF: 15,804
- ✓ Aïda Falgàs, Victor Pallarès, Ugutz Unzueta, María Virtudes Céspedes, Irene Arroyo-Solera, María José Moreno, Alberto Gallardo, María Antonia Mangues, Jorge Sierra, Antonio Villaverde, Esther Vázquez, Ramon Mangues, and Isolda Casanova. 2020. A CXCR4-targeted nanocarrier achieves highly selective tumor uptake in diffuse large B-cell lymphoma mouse models. *Haematologica*. 2020. 105: 741-753. IF: 7,116
- ✓ Eric Voltà-Durán, Olivia Cano-Garrido, Naroa Serna, Hèctor López-Laguna, Laura Sánchez-García, Mireia Pesarrodona, Ramón Mangues, Antonio Villaverde, Esther Vázquez, Ugutz Unzueta. Controlling self-assembling and tumor cell-targeting of protein-only nanoparticles through modular protein engineering. *Science China Materials* 2020, 63: 147–156. IF: 6.098

Publications 2020 (cont)

- ✓ María Virtudes Céspedes, Olivia Cano-Garrido, Patricia Álamo, Rita Sala, Alberto Gallardo, Naroa Serna, Eric Voltà-Durán, Alejandro Sánchez-Chardi, Laura Sánchez-García, Ugutz Unzueta, Esther Vázquez, Ramón Mangues, Antonio Villaverde. 2020. Engineering secretory amyloids for remote and highly selective destruction of metastatic foci. *Advanced Materials*. 32: 1907348. IF: 27.398
- ✓ Ugutz Unzueta, Mónica Roldán; Mireia Pesarrodona; Raul Benitez; Alejandro Sanchez Chardi; Oscar Conchillo Solé; Ramon Mangues; Antonio Villaverde; Esther Vazquez. 2020. Self-assembling as regular nanoparticles dramatically minimizes photobleaching of tumor-targeted GFP. *Acta Biomaterialia*. 103: 272-280. IF: 7.242
- ✓ Mireia Pesarrodona, Laura Sánchez-García, Joaquin Seras-Franzoso, Alejandro Sánchez-Chardi, Ricardo Baltà-Foix, Patricia Cámara-Sánchez, Petra Gener, José Juan Jara, Daniel Pulido, Naroa Serna, Simó Schwartz Jr., Miriam Royo, Antonio Villaverde, Ibane Abasolo, Esther Vazquez. 2020. Engineering a Nanos tructured Nucleolin-Binding Peptide for Intracellular Drug Delivery in Triple-Negative Breast Cancer Stem Cells. *ACS Appl. Mater. Interfaces*, 12, 5, 5381-5388. IF: 8.758
- ✓ Naroa Serna, Patricia Álamo, Prashanthi Ramesh, Daria Vinokurova, Laura Sánchez-García, Ugutz Unzueta, Alberto Gallardo, M^a Virtudes Céspedes, Esther Vázquez, Antonio Villaverde, Ramón Mangues and Jan Paul Medema. 2020. Nanostructured Toxins for the Selective Destruction of Drug Resistant Human CXCR4⁺ Colorectal Cancer Stem Cells. *Journal of Controlled Release* 320: 96–104. IF: 7.727
- ✓ José Vicente Carratalá, Olivia Cano-Garrido, Julieta Maria Sanchez, Cristina Membrado, Eudald Pérez, Oscar Conchillo-Solé, Xavier Daura, Alejandro Sánchez-Chardi, Antonio Villaverde, Anna Arís, Elena Garcia-Fruitós, Neus Ferrer-Miralles. 2020. Aggregation-prone peptides modulate activity of bovine interferon gamma released from naturally occurring protein nanoparticles. *New BIOTECHNOLOGY* 57: 11–19. IF: 4.674
- ✓ Laia Gifre-Renom, Joaquin Seras-Franzoso, Diana Rafael, Fernanda Andrade, Olivia Cano-Garrido, Francesc Martinez-Trucharte, Estefania Ugarte-Berzal, Erik Martens, Lise Boon, Antonio Villaverde, Ghislain Opdenakker, Simó Schwartz, Jr, Anna Arís, Elena Garcia-Fruitós. 2020. The biological potential hidden in inclusion bodies. *Pharmaceutics* 2020, 12, 157. IF: 4.421
- ✓ Rosemary Thwaite, Concepcion Berbel, Manuel Aparicio, Debora Torrealba, Mireia Pesarrodona, Antonio Villaverde, Juan José Borrego, Manuel Manchado and Nerea Roher. 2020. Nanostructured recombinant protein particles raise specific antibodies against the nodavirus NNV coat protein in sole. *Fish and Shellfish Immunology*, 99: 578-586. IF: 3.298
- ✓ Victor Pallarès; Ugutz Unzueta; Aïda Falgàs; Laura Sánchez-García; Naroa Serna; Alberto Gallardo; Gordon A. Morris; Lorena Alba-Castellón; Patricia Álamo; Jorge Sierra; Antonio Villaverde; Esther Vázquez; Isolda Casanova; Ramon Mangues. 2020. An Auristatin nanoconjugate targeting CXCR4+ leukemic cells blocks acute myeloid leukemia dissemination. *Journal of Hematology & Oncology*, 13, 1-19. IF: 11.059
- ✓ Aïda Falgàs, Victor Pallarès, Naroa Serna, Laura Sánchez-García, Jorge Sierra, Alberto Gallardo, Lorena Alba-Castellón, Patricia Álamo, Ugutz Unzueta, Antonio Villaverde, Esther Vázquez, Ramon Mangues and Isolda Casanova. 2020. Selective delivery of T22-PE24-H6 to CXCR4+ diffuse large B-cell lymphoma cells leads to wide therapeutic index in a disseminated mouse model. *Theranostics*. 10: 5169-5180. IF: 8.579
- ✓ Marc Martínez-Miguel, Adriana R. Kyvik, Lena Montaña, Albert Martínez-Moreno, Olivia Cano-Garrido, Elena Garcia-Fruitós, Esther Vazquez, Nora Ventosa, Judith Guasch, Jaume Veciana, Antonio Villaverde and Imma Ratera1. 2020. Stable Anchoring of Bacteria-based Protein Nanoparticles for Surface Enhanced Cell Guidance. *Journal of Materials Chemistry B*, 8: 5080-5088. IF: 5.344
- ✓ Naroa Serna, Olivia Cano-Garrido, Laura Sánchez-García, Mireia Pesarrodona, Ugutz Unzueta, Alejandro Sánchez-Chardi, Ramon Mangues, Esther Vázquez and Antonio Villaverde. 2020. Engineering protein venoms as self-assembling CXCR4-targeted cytotoxic nanoparticles. *Particle and Particle Systems Characterization* 37: 2000040. IF: 3.099
- ✓ Laia Gifre-Renom, Estefania Ugarte-Berzal, Erik Martens, Lise Boon, Olivia Cano-Garrido, Esther Martínez-Núñez, Teresa Luque, Ramon Roca Pinilla, Oscar Conchillo, Neus Ferrer, Antonio Villaverde, Ghislain Opdenakker, Elena Garcia-Fruitós, Anna Arís. 2020. Recombinant Protein-Based Nanoparticles: Elucidating their Inflammatory Effects In Vivo and their Potential as a New Therapeutic Format. *Pharmaceutics*, 12, 450. IF: 4.421
- ✓ Hèctor López-Laguna, Laura Sánchez-García, Naroa Serna, Eric Voltà-Durán, Julieta M. Sánchez, Alejandro Sánchez-Chardi, Ugutz Unzueta, Marcin Los, Antonio Villaverde and Esther Vázquez. 2020. Engineering protein nanoparticles out from components of the human microbiome. *Small* 30: 2001885. IF: 11.459

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- ✓ L. Gifre-Renom, J. V. Carratalá, S. Parés, L. Sanchez-Garcia, N. Ferrer-Miralles, A. Villaverde, A. Bach, Elena Garcia-Fruitós, Anna Arís. 2020. Potential of MMP-9 based nanoparticles at optimizing the cow dry period: pulling apart the effects of MMP-9 and nanoparticles. *Scientific Reports* 10: 11299. IF: 3.998
- ✓ Laura Sanchez-García; Rita Sala; Naroa Serna; Patricia Alamo; Eloi Parladé; Lorena Alba-Castellón; Eric Voltà-Durán; Alejandro Sánchez-Chardi; Ugutz Unzueta; Esther Vázquez; Ramon Mangues; Antonio Villaverde. 2020. A refined cocktailing of pro-apoptotic nanoparticles boosts anti-tumor activity. *Acta Biomaterialia* 113: 584-596. IF: 7.242
- ✓ Jose Vicente Carratalá, Naroa Serna, Antonio Villaverde, Esther Vázquez, Neus Ferrer-Miralles. 2020. Nanostructured antimicrobial peptides: the last push towards clinics. *Biotechnology Advances* 44: 107603. IF: 10.744
- ✓ Naroa Serna, Olivia Cano-Garrido, Julieta M. Sánchez, Alejandro Sánchez-Chardi, Laura Sánchez-García, Hèctor López-Laguna, Ester Fernández, Esther Vázquez and Antonio Villaverde. 2020. Release of functional fibroblast growth factor-2 from artificial inclusion bodies. *Journal of Controlled Release* 327: 61-69. IF: 7.727
- ✓ Hèctor López-Laguna, Julieta Sánchez, Ugutz Unzueta, Ramón Mangues, Esther Vázquez and Antonio Villaverde. 2020. Divalent cations: A molecular glue for protein materials. *Trends in Biochemical Sciences* 45: 992-1003. IF: 14.732
- ✓ Hèctor López-Laguna, Rafael Cubarsi, Ugutz Unzueta, Ramón Mangues, Esther Vázquez & Antonio Villaverde. 2020. Endosomal escape of protein nanoparticles engineered through humanized histidine-rich peptides. *Science China Materials* 63:644–653. IF: 6.098
- ✓ Patricia Álamo, Victor Pallarès, María Virtudes Céspedes, Aïda Falgàs, Julieta M. Sanchez, Naroa Serna, Laura Sánchez-García, Eric Voltà-Duràn, Gordon A. Morris , Alejandro Sánchez-Chardi, Isolda Casanova, Ramón Mangues, Esther Vazquez, Antonio Villaverde and Ugutz Unzueta. 2020. Fluorescent Dye Labeling Changes the Biodistribution of Tumor-Targeted Nanoparticles. *Pharmaceutics*, 12, 1004. IF: 4.421
- ✓ Serna, Naroa; Carratalá, Jose Vicente; Parladé, Eloi; Sánchez-Chardi, Alejandro; Aviño, Anna; Unzueta, Ugutz; Mangues, Ramon; Eritja, Ramon; Ferrer-Miralles, Neus; Vazquez, Esther; Villaverde, Antonio. 2020. Developing protein-antitumoral drug nanoconjugates as bi-functional antimicrobial agents. *ACS Applied Materials & Interfaces* 12: 57746–57756. IF: 8.456
- ✓ Jose V. Carratalá, Eric Brouillette, Naroa Serna, Alejandro Sanchez-Chardi, Julieta M. Sanchez, Antonio Villaverde, Anna Arís, Elena Garcia-Fruitós, Neus Ferrer-Miralles, François Malouin. 2020. Bactericidal efficacy of protein nanoparticles displaying antimicrobial peptides, a potential alternative to antibiotics. *Pharmaceutics*. 12: 1217. IF: 4.421
- ✓ Ibane Abasolo, Joaquin Seras-Franzoso, Marc Moltó-Abad, Vanessa Díaz-Riascos, José Luis Corchero, Guillem Pintos-Morell, Simó Schwartz Jr. 2020. Nanotechnology-based approaches for treating lysosomal storage disorders, a focus on Fabry disease. *Wiley Interdiscip Rev Nanomed Nanobiotechnol* Dec 13; e1684. IF: 7.689
- ✓ E. Puente-Massaguer, P. Saccardo, N. Ferrer-Miralles, M. Lecina, F. Gòdia. 2020. Coupling Microscopy and Flow Cytometry for a Comprehensive Characterization of Nanoparticle Production in Insect Cells. *Cytometry. A*. 97: 921. JCR 2019. IF: 3.124.
- ✓ E. Villagrasa, R. Egea, N. Ferrer-Miralles, A. Solé. 2020. Genomic and biotechnological insights on stress-linked polyphosphate production induced by chromium(III) in *Ochrobactrum anthropi* DE2010. *World J. Microbiol. Biotechnol.* 36: 97. JCR 2019 IF: 2.447.
- ✓ Noguera-Ortega E., Guallar-Garrido S., and Julián E. (2020) Mycobacteria-based vaccines as immunotherapy for non-urolological cancers. *Cancers*. 12, 1802. IF: 6.126.
- ✓ Guallar-Garrido S., Campo-Pérez V., Sánchez-Chardi A., Luquin M., and Julián E. (2020) Each mycobacterium requires a specific culture medium composition for triggering an optimized immunomodulatory and antitumoral effect. *Microorganisms*. 8(5), 734. IF: 4.152.
- ✓ Bach-Griera M., Campo-Pérez V., Barbosa S., Traserra S., Guallar-Garrido S., Moya-Andérico L., Herrero-Abadía P., Luquin M., Rabanal R.M., Torrents E., and Julián E. (2020) Mycolicibacterium *brumae* is a safe and non-toxic immunomodulatory agent. *Vaccines*. 8(2), 198. IF: 4.086.
- ✓ Arias L., Cardona P., Català M., Campo-Pérez V., Prats C., Vilaplana C., Julián E., Cardona P.J. (2020) Cording Mycobacterium tuberculosis bacilli have a key role in the progression towards active tuberculosis, which is stopped by previous immune response. *Microorganisms*. 8(2), 228. IF: 4.152.
- ✓ Guallar-Garrido S., Julián E. Bacillus Calmette-Guérin (BCG) therapy for bladder cancer: an update. *ImmunoTargets and Therapy*. 2020. 9: 1–11.

Environmental Microbiology Group

Members

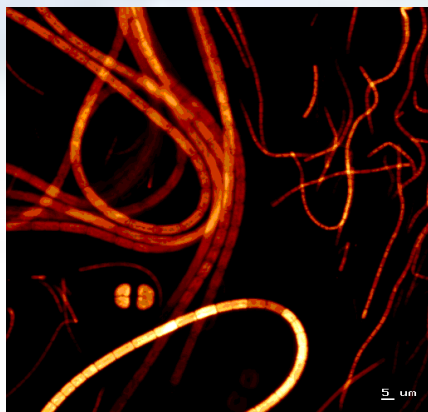
Dr. Antoni Solé (PI)

Dr. Olga Sánchez
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Anahita Hosseini
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Mireia Núñez
Martí Pla
Denis Rajnovic
Carlota Ruiz
Cristina Sosa
Núria Vigués
Eduard Villagrasa



Research

The scientific activity of the group relates to applied areas in the field of Environmental Microbiology, which have in common the impact of human activities on ecosystems, such as the study of the response of microbial communities to contaminants, as well as the development of electrochemical sensors for the measurement of toxicity in waters. The group is also specialized in the application of high throughput methodologies to understand the functional potential of microbial communities and the factors that regulate them in natural environments.



Publications 2020

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Molecular Microbiology Group

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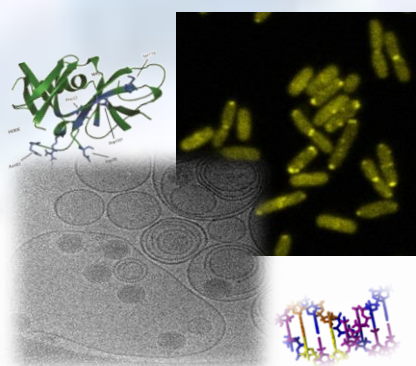
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Research

Research is focused in the following four topics: i) DNA repair (SOS system) and mechanisms of bacterial pathogenesis; ii) Identification of bacterial targets for new antimicrobial compounds development; iii) Bacteriophage therapy; iv) High-affinity iron uptake systems as targets for immunotherapy.

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VHIR Research Group of Microbiology

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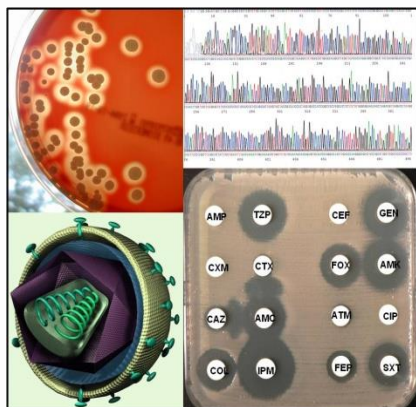
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Research

The Research Group of Microbiology at Vall d'Hebron Research Institute (VHIR) focuses on the study of the microbiology aspects, at basic, translational and clinical research, that could improve the outcomes of patients with infectious diseases. We work with special interest in studying the mechanisms involved in antimicrobial resistance, sexually transmitted infections, viral respiratory infections, international health infections, and viral and fungal infections in immunocompromised patients.



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Main Lines of Research

Clinical Microbiology

- Detection and characterisation of different antimicrobial mechanisms of resistance.
- Tuberculosis, epidemiology and antituberculosis resistance mechanisms.
- Molecular biology applications in infectious disease detection, taxonomy and epidemiology.
- Microbiome description in different clinical samples.
- Leishmaniosis: Epidemiology, characterisation and diagnosis.
- Chagas diseases, diagnosis and study of congenital infection
- Medical care projects.
- Detection, characterization and molecular epidemiology of respiratory viruses, cytomegaloviruses, enteroviruses and polioviruses, among others

Infectious Diseases

- Restricted-use policies for antibiotic and antimicrobial agents and suitable use of antimicrobial agents.
- Study of infections due to antimicrobial multiresistant microorganisms requiring patient isolation.
- Study of infections associated with foreign bodies (joint prostheses, catheters, cardiac prostheses and pacemakers).
- Tuberculosis.

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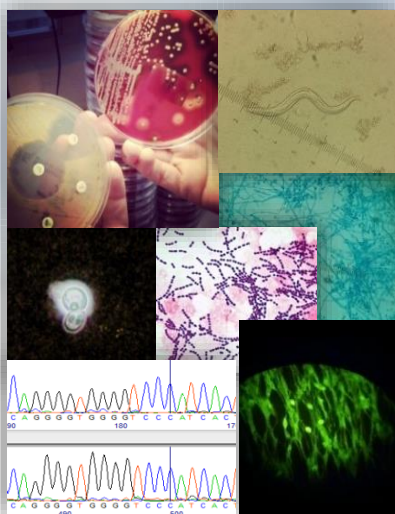
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Research



Our Group, led by Prof. Lurdes Matas, MD, PhD, Head of the Microbiology Service at Hospital Unversitari Germans Trias i Pujol, is involved in several Spanish research networks including REIPI, RESITRA, CIBERES and CIBERESP and is focused in the development, standardization and clinical evaluation of microbiological, immunological and molecular techniques in the diagnosis of infectious diseases. Part of the Group is also devoted to the development of experimental models in infectious pathology, the study of the molecular mechanisms of antimicrobial resistance, and on the assessment of the antimicrobial activity of new drugs. Our historical focus is on respiratory pathogens, especially *Mycobacterium tuberculosis* and opportunistic mycobacteria. Additionally, other research lines led by different group members, such as molecular virology, pathogenesis of viral infection, immunology of inflammation and new bacterial anti-inflammatory molecules, as well as epidemiology and public health of communicable diseases, have acquired more relevance over the last decade.

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Community and Health-Care Related Infection Study Group

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Research

Community and Health-Care Related Infection Study Group' is headed by Dr Oriol Gasch since 2016. It is currently accredited as a Consolidated Investigation Group of the Generalitat de Catalunya (Agència de Gestió d'ajuts universitaris I de Recerca – AGAUR; SGR- 2017-677) and has obtained public financial support for years. The group is member of the Spanish network for research in infectious diseases (REIPI) Spanish Network for Research in Infectious Diseases (REIPI) (RD16/0016/0014) and the Network of AIDS research (RIS) (RD16/0025/0033), both funded by the Spanish ministry of economy and competitiveness (ISCIII). Our group has studied the pathogenic mechanisms of several infections since the 80s by a collaborative work between a multidisciplinary team, including physicians, research and clinical nurses, microbiologist, pharmacists, veterinarians, and epidemiologists who work around the Infectious Diseases Service of Parc Taulí Hospital. Most of them also have teaching responsibilities in the Universitat Autònoma de Barcelona. Our research team addresses different infections within a common framework, specifically, diseases related to healthcare, zoonoses, and HIV infection, from an epidemiological, clinical and therapeutic perspective. We summarize the orientation of all three research areas:

1.- Study of healthcare-related infections: Infections in the health field have a great individual and collective impact. The development of bacterial resistance, especially in the hospital environment, is a challenge in terms of handling and an increase in the risk of developing an unfavorable development. The lack of antibiotic treatments to face them make it known by the World Health Organization as one of the problems that will have the greatest impact in the coming years, specifically *Staphylococcus aureus* resistant to methicillin, *Klebsiella pneumoniae* and *Enterobacter* sp. Producers of extended spectrum betalactamases, *Enterococcus* sp. Resistant to vancomycin, *Pseudomonas aeruginosa* resistant to carbapenems, *Acinetobacter baumannii* resistant to carbapenems. Three main programmes guide our research in this area:

Programme 1: Management of multiresistance and difficult-to-treat infections

(1.1) Infections in critical patient

(1.2) Infective endocarditis and bloodstream infection

(1.3) Diagnostic of infectious diseases improving

Programme 2: Prevention of health-care related infections and antimicrobial resistance

(2.1) Education of sanitary staff and patients

(2.2) Epidemiology of HCR infections

(2.3) Innovative strategies for improving infection control

Programme 3: In vitro antimicrobial action and clinical efficacy

(3.1) PK/PD studies

(3.2) OPAT: Outpatient Parenteral Antimicrobial Therapy

(3.3) Appropriate use of antimicrobials

2.- Study of the main zoonoses with impact on health. The World Health Organization defines zoonoses as "any disease transmitted naturally from animals to humans or vice versa". As a consequence of the development of new molecular techniques, as well as changes in the pattern of behavior of the human population, new species have been described in the zoonoses or the re-emergence of ancient species. The research team started working on this line in 1980, coinciding with a remarkable increase in cases of Mediterranean Bontose Fever, (*Rickettsia conorii*). Currently the team's search encompasses all fields: veterinary, diagnostic, epidemiological, clinical, therapeutic ... In recent years, the priority lines are, on the one hand, identify new hosts and vectors and establish their role Epidemiologic in the transmission and maintenance of emerging zoonoses (*R. massiliae*-Bar29, new *Bartonella* species, other emerging zoonotic microorganisms) and confirm and describe their clinical practice in humans as well as in pets (clinical description Epidemiology and determination of risk factors). On the other hand, because the main diagnostic difficulty of these microorganisms is due to its intracellular nature, which does not allow the application of conventional cultivation techniques, one of the main objectives is the optimization of molecular techniques to improve diagnosis (PCR, arrays, ...).

3.- Study of the patient infected by the Human Immunodeficiency Virus (HIV). The HIV infection is one of the current great pandemics, of which there are still unresolved aspects. The group belongs to the RETICS network called RIS (AIDS Research Network) in which it carries out collaborative studies with other centers in the state. One of the objectives of the group is to continue participating in clinical trials that provide new knowledge about treatment with all that entails regarding improvement of quality of life, co-infections and increase in life expectancy. We also have a very high priority in our collaboration, very actively, in different HIV, national and international cohorts, contributing patient data as well as promoting specific studies led by the group (PISCIS, CORIS, COHERE, ART Cohort Collaboration). One of the main lines of the group is the study of the reconstitution of the immune system under HAART therapy and its possible age-dependent differences. Studying the dynamics of the immune system in elderly patients is of major importance. One of the translational objectives of this line is to find therapeutic targets and/or biomarkers that allow a more targeted treatment/monitoring based on the characteristics of the patient. Not only does this subpopulation of patients be studied from an immunological point of view but also from an epidemiological point of view: what risk factors, adherence to treatment, comorbidities, diagnostic retardation are age-dependent. Another of the problems posed at present is also an objective of this line: to address the comorbidities that appear and the co-infection by HCV.



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- Clinical Predictive Model of Multidrug Resistance in Neutropenic Cancer Patients with Bloodstream Infection Due to *Pseudomonas aeruginosa*. C Gudíol, A Albasanz-Puig, J Laporte-Amargós, N Pallarès, A Mussetti, I Ruiz-Camps, P Puerta-Alcalde, E Abdala, C Oltolini, M Akova, M Montejo, M Mikulska, P Martín-Dávila, F Herrera, **O Gasch**, L Drgona, H Paz Morales, A-S Brunel, E García, B Isler, W V Kern, I Morales, G Maestro-de la Calle, M Montero, S S Kanj, O R Sipahi, S Calik, I Márquez-Gómez, J I Marin, M Z R Gomes, P Hemmatti, R Araos, M Peghin, J L Del Pozo, L Yáñez, R Tilley, A Manzur, A Novo, J Carratalà, IRONIC Study Group. Antimicrob Agents Chemother. 2020 Mar 24;64(4):e02494-19. doi: 10.1128/AAC.02494-19. Print 2020 Mar 24. PMID: 32015035. IF: 4.904, Q1.
- A framework to develop semiautomated surveillance of surgical site infections: An international multicenter study. Stephanie M van Rooden, Evelina Tacconelli, Miquel Pujo, **Aina Gomila**, Jan A J W Kluytman, Jannie Romme, Gonny Moen, Elodie Couvé-Deacon, Camille Bataille, Jesús Rodríguez Baño, Joaquín Lanz, Maaïke S M van Mourik. Infect Control Hosp Epidemiol. 2020 Feb;41(2):194-201. doi: 10.1017/ice.2019.321. PMID: 31884977. IF: 2.938, Q2.
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- Effectiveness of the combination elvitegravir/cobicistat/tenofovir/emtricitabine (EVG/COB/TFV/FTC) plus darunavir among treatment-experienced patients in clinical practice: a multicentre cohort study. Inés Suárez-García, Cristina Moreno, Marta Ruiz-Algueró, María Jesús Pérez-Elías, **Marta Navarro**, Marcos Díez Martínez, Pompeyo Viciano, Laura Pérez-Martínez, Miguel Górgolas, Concha Amador, Miguel Alberto de Zárraga, Inma Jarrín, Cohort of the Spanish HIV/AIDS Research Network (CoRIS). AIDS Res Ther. 2020 Jul 20;17(1):45. doi: 10.1186/s12981-020-00302-2. PMID: 32690099. IF: 2.19, Q2.
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Genome Instability and DNA Repair Syndromes Group

Members

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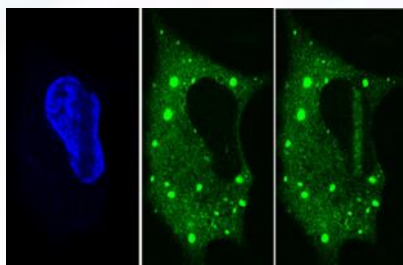
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Research



Our research interests are cancer-prone genetic syndromes with defective DNA repair with special focus in Fanconi anemia. We also investigate the genetics of familiar cancer syndromes and perform therapeutic research including gene and cell therapy approaches and cell-based drug screening platforms. A long term goal is to understand the mechanisms that maintain genome stability and protect us from disease, cancer, and ageing.

Publications 2020

Olga M. Moreno, Ana I. Sánchez, Angélica Herreño, Gustavo Giraldo, Fernando Suárez, Juan Carlos Prieto, Ana Shaia Clavijo, Mercedes Olaya, Yaris Vargas, Javier Benítez, Jordi Surallés, Adriana Rojas. Phenotypic Characteristics and Copy Number Variants in a Cohort of Colombian Patients with VACTERL Association. *Mol Syndromol*. Published online: November 11, 2020. DOI: 10.1159/000510910. Area: Genetics, 2n quartil . IF: 1.81.

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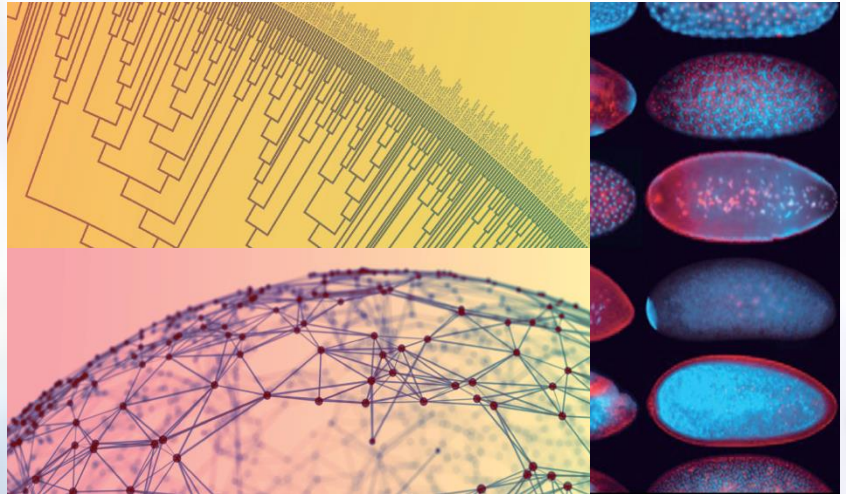
Ramírez MJ, Minguillón J, Loveless S, Lake K, Carrasco E, Stjepanovic N, Balmaña J, Català A, Mehta PA, Surrallés J* Chromosome fragility in the buccal epithelium in patients with Fanconi anèmia. *Cancer Lett.* 2020 Mar 1;472:1-7. Area: Oncology. 1r quartil . IF: 6.50. ISSN 1872-7980

Genomics, Bioinformatics and Evolutionary Biology Group (GBBE)

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Research

Our research field is Evolutionary Biology, a complex historical process that accounts for Biodiversity on earth. We seek to understand the mechanisms that generate diversity patterns at nucleotide, chromosomal, phenotypical and geographical level. Our multidisciplinary team includes researchers with diverse expertise that use different but complementary approaches: from experimental and field work to bioinformatics and modelization. Besides, our experimental work makes use of different species as model systems: pathogenic bacteria, *Drosophila* and humans. We are engaged in projects of adaptation of *Drosophila* populations to global climate change, impact of interspecific hybridization on transposable element deregulation, genome-wide analyses of nucleotide and structural variability, modelization of the genotype-phenotype map, evolution and spread of pathogenic bacteria such as *Vibrio* and *Salmonella* and functional and evolutionary impact of inversions in the human genome.

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Mutagenesis Group

Members

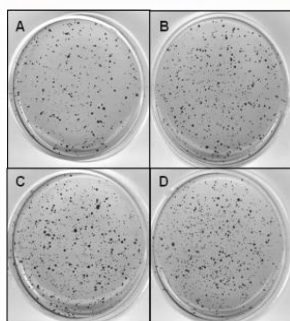
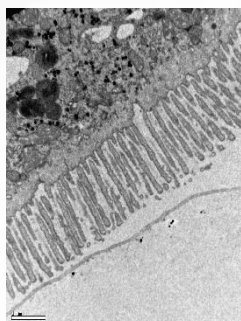
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Dra. Alba Hernández
Dra. Constanza Cortés
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Research



Our team works on the following topics: (i) molecular mechanisms involved in the genotoxicity/carcinogenicity of contaminants of environmental concern, using long-term exposures and environmental relevant doses; (ii) *In vitro* and *in vivo* models to determine the genotoxic/carcinogenic risk of nanomaterial (including nanoplastics) exposures and their uptake through intestinal barriers; (iii) Genomic instability in patients suffering from chronic renal pathologies, and procedures to ameliorate the genotoxic risk

Publications 2020

- ✓ Joffrey Pelletier J., F. Riaño-Canalias, E. Almacellas, C. Mauvezin, S. Samino, S. Feu, S. Menoyo, A. Domostegui, M. Garcia, R. Salazar, C. Cortés, R. Marcos, A. Tauler, O. Yanes, N. Agell, S.C. Kozma, A. Gentilella, G. Thomas. Nucleotide depletion reveals the impaired ribosome biogenesis checkpoint as a barrier against DNA damage. *EMBO Journal*, 39: E103838 (2020). IF: 9.889.
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- ✓ Alaraby M., E. Demir, A. Velázquez, A. Hernández, R. Marcos. Toxic and genotoxic *in vivo* effects of cobalt nanoparticles, as detected in *Drosophila melanogaster* *Environmental Science: Nano*, 7: 610-622 (2020). IF: 7.683.
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- ✓ Barguilla, I., G. Barszczewska, B. Annangi, J. Domenech, A. Velázquez, R. Marcos, A. Hernández. *MTH1* is involved in the toxic and carcinogenic long-term effects induced by zinc oxide and cobalt nanoparticles. *Archives of Toxicology*, 94 (6): 1973-1984 (2020). IF: 5.059.
- ✓ Kazimirova, A., N. El Yamani, L. Rubio, A. García-Rodríguez, M. Barancokova, R. Marcos, M. Dusinska. Effects of titanium dioxide nanoparticles on the *Hprt* gene mutation in V79 hamster cells. *Nanomaterials*, 10: 465 (2020). IF: 4.324.
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- ✓ Barguilla, I., J. Bach, J. Peremartí, R. Marcos, A. Hernández. Arsenic-induced overexpressed *FRA1* under chronic exposure settings is essential for the acquisition of an oncogenic phenotype. *Metallomics*, 12: 2161-2173 (2020) IF: 3.796.
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PhD Thesis 2020

1. Díaz Ocaña, Raquel. "Recombinant self-assembling nanoparticles for cancer therapy based on toxin and venom compounds". Doctorat en Biotecnologia.
2. Jiménez Ezenarro, Josune. "Integrated devices for the concentration and detection of waterborne bacteria". Doctorat en Microbiologia.
3. Vigués Frantzen, Núria. "High-density bacterial immobilization strategies for the development of microbial biosensors". Doctorat en Microbiologia.
4. Royo Llonch, Marta. "Ecogenomics of uncultured marine prokaryotes". Doctorat en Microbiologia.
5. Arredondo Campaña, Alex. "Prevalencia y caracterización de genes de resistencia a antibióticos en bacterias orales.". Doctorat en Microbiologia.
6. Ramon Gurrea, Elies. "Kernel approaches for complex phenotype prediction". Doctorat en Genètica.
7. Sánchez Morillo, Alba. Patogénesis de *Staphylococcus epidermis* en la infección de prótesis articular. Doctorat en Microbiologia.
8. Rodríguez Navarro, Judith. "Diversity of plasmids in *Escherichia coli* and *Klebsiella pneumoniae* strains: a comparison of commensal and clinical isolates ". Doctorat en Microbiologia.
9. Corral Sábado, Jordi. "Implicación de la motilidad en la patogénesis bacteriana". Doctorat en Microbiologia.
10. Despuig Busquet, Albert. "The Study of Human Tuberculosis Lesions: circulant and transcriptional biomarkers in a cohort of tuberculosis patients undergoing therapeutic surgery". Doctorat en Microbiologia.
11. Sánchez Osuna, Miquel. "Origen y evolución de los genes que confieren resistencia clínica a sulfamidas y a trimetoprim". Doctorat en Microbiologia.
12. Goterris Bonet, Lidia. "*Pneumocystis jirovecii* en el siglo XXI". Doctorat en Microbiologia.



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Juny 2021