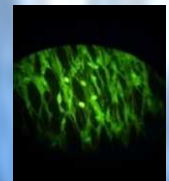
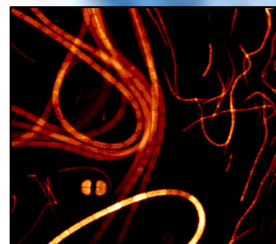
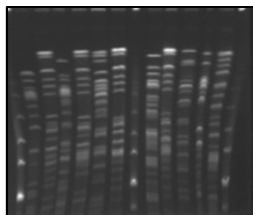
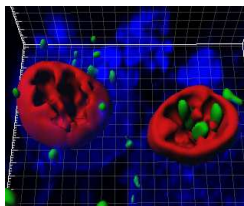
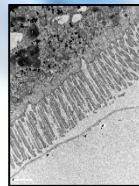
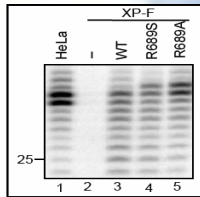

Department of Genetics and Microbiology
Universitat Autònoma de Barcelona



2019
ANNUAL SCIENTIFIC REPORT



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Introducció / Introduction



És per a mi un honor i un plaer ser la directora del Departament des de 2020 a 2022. Seran tres anys moguts, en els que el SARS CoV-2 tindrà molt a dir, però estic ben segura que amb la col·laboració de tothom farem que la nostra activitat docent i de recerca no es vegi pràcticament afectada.

Una vegada superada la fase de confinament total que hem patit, hem tornat a re-emprendre les nostres activitats, si bé la comunicació i la docència virtual ja formen part de les nostres vides.

Una de les conseqüències de la COVID ha estat l'endarreriment de la memòria de recerca del 2019. Us demano disculpes. Com podeu veure en ella, el nostre Departament continua mantenint un alt nivell d'excel·lència científica. El nombre de publicacions indexades ha augmentat lleugerament, situant-se en 189, es manté un factor d'impacte mitjà elevat d'aquestes publicacions (4,439 per a totes les publicacions i 12,92 per a les que corresponen al 10% de les millors). El nombre de tesis defensades és de 15, nivell mitjà dels darrers anys, tret de l'augment patit en el 2015-16 com a conseqüència del canvi definitiu de pla.

A diferència del que veníem observant en la quantia dels ingressos per projectes i convenis, en el 2019 s'ha augmentat lleugerament aquests valors, arribant a un total d'ingressos de 1.447.975 €.

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.

It is an honor and a pleasure to be the director of the Department from 2020 to 2022. I am sure it will be three complicated years, in which the SARS CoV-2 will have a lot to say. However, our teaching and research activity will be hardly affected thanks to everyone's collaboration. Once we have overcome the phase of total confinement, we have resumed our activities, although communication and virtual teaching are now already part of our lives. The delay in the publication of the 2019 research report is one of the consequences of COVID. I apologize for it.

As you can see in this report, our Department continues to maintain a high level of scientific excellence. The number of JCR-indexed publications (189) has slightly increased, maintaining a high average impact factor (4.439 for all publications, and 12.92 for those corresponding to the top 10%. The number of theses defended is 15, similar to recent years, except for the increase suffered in 2015-16 because of the end of the PhD previous plan.

Contrary to what we have been observing in recent years, in 2019 the projects' income and agreements have increased slightly, reaching a total amount of 1,447,975 €.

We can therefore 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 Department

The Department of Genetics and Microbiology (DGM) is in charge of organizing and developing research and teaching in the disciplines included in the areas of Genetics and Microbiology. It is an Interfaculty Department, formed by three Units, two located in the Campus at the Faculty of BioSciences (Genetics Unit and Microbiology Unit Campus) and the third (Medical Microbiology Unit) for integrated teaching and research in the area Clinical Microbiology at the five UAB Hospitals (Sant Pau, Vall d'Hebron, Hospital del Mar, Germans Trias i Pujol and Parc Tauli).

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

Further info at:

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

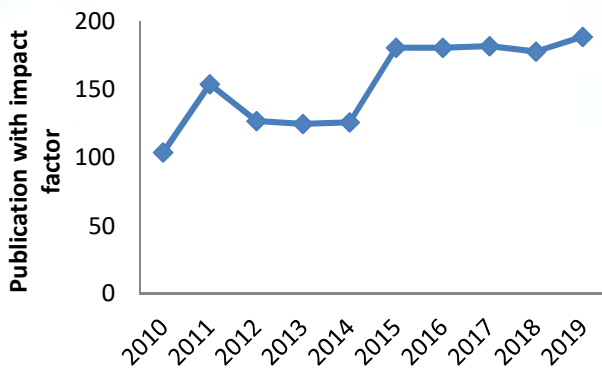
The screenshot shows the website for the Department of Genetics and Microbiology at the University of Barcelona. The header includes the UAB logo, the department name 'DEPARTAMENT DE GENÈTICA I MICROBIOLOGIA', and navigation links like 'Mapa web', 'Intranet', and 'Directori'. A search bar is also present. Below the header, there are tabs for 'El departament', 'La docència', and 'La recerca'. The main content area features a large image of red, textured biological structures. There are three columns of content: 'NOTÍCIES' with a news item about genetic recombination, 'DESTACATS' with a link to the 'ANNUAL SCIENTIFIC REPORT - 2014', and 'ENLLAÇOS DIRECTES' with a list of links such as 'UABDivulga', 'Ajuts, Beques i Convocatòries', and 'Publicacions científiques'. A footer section mentions '30a. edició Aspectes Generals i d'investigació' and 'Parc de Recerca'.

Analysis of Scientific Production (2019)

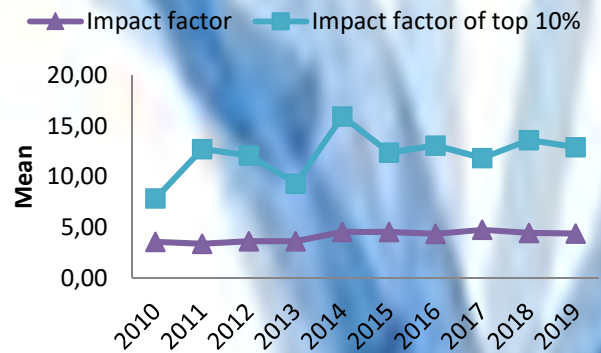


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Number of publication with impact factor	104	154	127	125	126	181	181	182	178	189
Total impact factor	372,43	521,38	460,76	454,33	569,71	826,80	793,69	866,43	793,46	830,20
Mean impact factor	3,58	3,39	3,63	3,63	4,55	4,57	4,38	4,76	4,46	4,39
Mean impact factor of top 10%	7,86	12,73	12,11	9,31	15,94	12,39	13,06	11,84	13,61	12,92
PhD thesis defended	21	20	17	17	12	24	24	15	19	15
Competitive income (grants) in euros	940.412	781.163	962.260	382.874	931.469	133.100	1.054.491	33.960	1.209.899	1.280.557
Non-competitive income in euros	82.912	184.065	247.820	84.358	80.198	357.958	199.611	27.788	167.579	197.418
Total income in euros	1.023.324	965.229	1.210.081	467.232	1.011.667	491.058	1.254.102	61.748	1.377.478	1.477.975

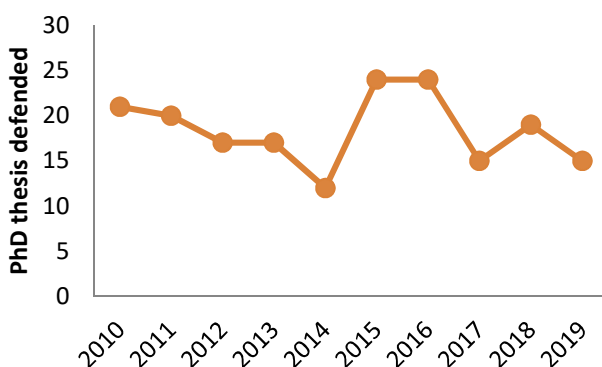
Number of indexed publications



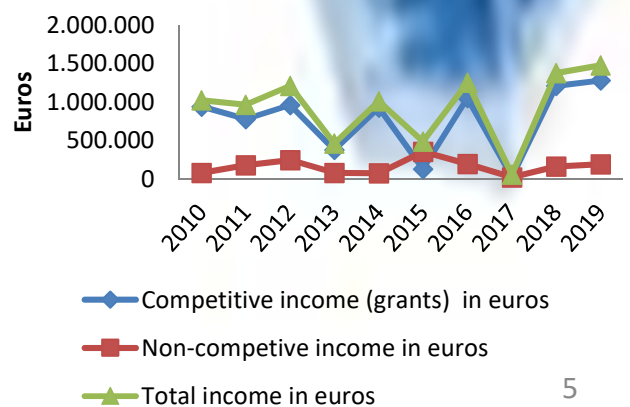
Impact Factors (SCI)



Number of PhD Thesis



Financial research incomes



Research Groups Performance

2019



Bacterial Pathogenesis and Antimicrobials Group

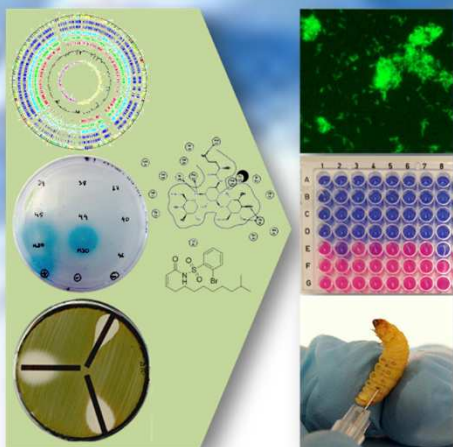
Members

Dr. Isidre Gibert
Dr. Xavier Daura
Dr. Daniel Yero
Dr. Pol Huedo
Dra. Celeste Gómez
Oscar Conchillo
Xavier Coves



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

- ✓ Non-essential biological processes in *Stenotrophomonas maltophilia* as targets for the design of new antimicrobial strategies; Ministerio de Ciencia e Innovación (Ref. BIO2015-66674-R); 01.01.2016 - 31.12.2019
- ✓ AMB Advanced Therapeutics: Potentiating current antibiotics against life-threatening resistant hospital-acquired infections; Fundació "la Caixa" i Caixa Capital Risk (Caixalmpulse, ref. CI17-00021); 01.07.2017 - 31.06.2019

Publications 2019

- ✓ Huedo, P., Kumar, V. P., Horgan, C., Yero, D., Daura, X., Gibert, I., et al. (2019). Sulfonamide-based diffusible signal factor analogs interfere with quorum sensing in *Stenotrophomonas maltophilia* and *Burkholderia cepacia*. *Future Med. Chem.* 11, 1565–1582. doi:10.4155/fmc-2019-0015. (IF: 3.617 // Q2).
- ✓ Yero D, Huedo P, Coves X, Martínez-Servat S, Conchillo-Solé O, Gómez C, Daura X y Gibert I. Quorum sensing y resistencia a antibióticos en *Stenotrophomonas maltophilia*: ¿Están conectados estos mecanismos? *Sem@foro*. 2019. 68: 28-29. (Sense IF)
- ✓ Iglesias, V., Conchillo-Sole, O., Batlle, C., and Ventura, S. (2019). AMYCO: evaluation of mutational impact on prion-like proteins aggregation propensity. *BMC Bioinformatics* 20, 24. doi:10.1186/s12859-019-2601-3. (IF 2.511 // Q 1).
- ✓ Lopez-Laguna, H., Unzueta, U., Conchillo-Sole, O., Sanchez-Chardi, A., Pesarrodonna, M., Cano-Garrido, O., et al. (2019). Assembly of histidine-rich protein materials controlled through divalent cations. *Acta Biomater.* 83, 257–264. doi:10.1016/j.actbio.2018.10.030. (IF: 6.638 // Q1).

Members

Basic and Applied Microbiology Group

Dr. Antonio Villaverde (PI)

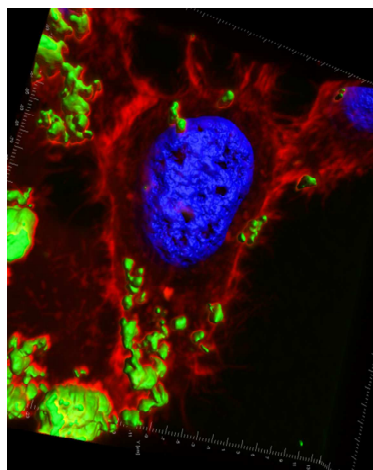
Dra. Marina Luquin
Dra. Neus Ferrer-Miralles
Dra. Esther Julián
Dr. José Luis Corchero
Dra. Esther Vázquez
Dr. Paolo Saccardo
Dra. Olivia Cano
Dra. Julieta M. Sánchez
Rosa Mendoza
Dra. Mercedes Márquez
Cristina Sosa
José Vicente Carratalá
Naroa Serna
Laura Sánchez
Sandra Guallar
Marc Bach
Paula Herrero
Victor Campo
Guadalupe Jiménez
Raquel Díaz
Hèctor López
Esther Martínez
Eric Voltà
Aida Carreño



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 2019

2018 Impact factors are indicated (in bold) when it applies.

- ✓ Ario de Marco, Neus Ferrer-Miralles, Elena Garcia-Fruitos, Anna Mitraki, Spela Peternel, Ursula Rinas, Mauricio Trujillo-Roldán, Norma Valdez-Cruz, Esther Vazquez, Antonio Villaverde. 2019. Bacterial inclusion bodies are industrially exploitable amyloids. *FEMS Microbiology Reviews*, 43: 53–72. **11.524**
- ✓ Hèctor López-Laguna, Ugutz Unzueta, Oscar Conchillo-Solé, Alejandro Sánchez-Chardi, Mireia Pesarrodona, Olivia Cano-Garrido, Eric Voltà, Laura Sánchez-García, Naroa Serna, Paolo Saccardo, Ramón Mangues, Antonio Villaverde and Esther Vázquez. 2019. Assembly of histidine-rich protein materials controlled through divalent cations. *Acta Biomaterialia* 83: 257-264. **6.638**
- ✓ Naroa Serna, Julieta M. Sánchez, Ugutz Unzueta, Laura Sánchez-García, Alejandro Sánchez-Chardi, Ramón Mangues, Esther Vázquez, Antonio Villaverde. 2019. Recruiting potent membrane penetrability in tumor cell-targeted protein-only nanoparticles. *Nanotechnology* 30: 115101. **3.399**

Publications 2019 (cont)

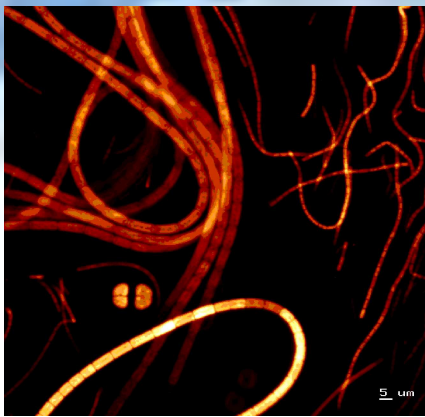
- ✓ Isolda Casanova, Ugutz Unzueta, Irene Arroyo, María Virtudes Céspedes, Antonio Villaverde, Ramon Mangues, Esther Vázquez. 2019. Protein-driven nanomedicines in oncotherapy. *Current Opinion in Pharmacology*, 47:1–7. **5.203**
- ✓ Raquel Díaz, Laura Sánchez-García, Naroa Serna, Alejandro Sánchez-Chardi, Olivia Cano-Garrido, Julieta M. Sánchez, Ugutz Unzueta, Esther Vázquez, Antonio Villaverde. 2019. Engineering a recombinant chlorotoxin as celltargeted cytotoxic nanoparticles. *Science China Materials*, 62, 892-898. **5.636**
- ✓ Aviño, Anna; Unzueta, Ugutz; Céspedes, Maria Virtudes; Casanova, Isolda; Vazquez, Esther; Villaverde, Antonio; Mangues, Ramon; Eritja, Ramon. 2019. Efficient bioactive oligonucleotide-protein conjugation for cell-targeted cancer therapy. *ChemistryOpen* 8: 382-387. **2.205**
- ✓ Mireia Pesarrodona, Toni Jauset, Zamira V. Díaz-Riascos, Alejandro Sánchez-Chardi, Marie-Eve Beaulieu, Joaquin Seras-Franzoso, Laura Sánchez-García, Ricardo Baltà-Foix, Sandra Mancilla, Yolanda Fernández, Ursula Rinas, Simó Schwartz Jr, Laura Soucek, Antonio Villaverde, Ibane Abasolo, and Esther Vázquez. 2019. Targeting antitumoral proteins to breast cancer by local administration of functional inclusion bodies. *Advanced Science* 6, 1900849. **15.804**
- ✓ Rita Sala; Laura Sánchez-García; Naroa Serna; María Virtudes Céspedes; Isolda Casanova; Alejandro Sánchez-Chardi; Ugutz Unzueta; Esther Vazquez; Ramón Mangues; Antonio Villaverde. Collaborative membrane activity and receptor-dependent tumor cell targeting for precise nanoparticle delivery in CXCR4+ colorectal cancer. 2019. *Acta Biomaterialia* 99: 426–432. **6.638**
- ✓ Tatkiewicz, Witold; Seras-Franzoso, Joaquin; García Fruitos, Elena; Vazquez, Esther; Kyvik, Adriana; Ventosa, Nora; Guasch, Judith; Villaverde, Antonio; Veciana, Jaume; Ratera, Imma. 2019. High-throughput cell motility studies on surface-bound protein nanoparticles with diverse structural and composition characteristics. *ACS Biomaterials Science & Engineering*. 5, 10, 5470-5480. **4.511**
- ✓ Hèctor López-Laguna, Rita Sala, Julieta M. Sánchez, Patricia Álamo, Ugutz Unzueta, Alejandro Sánchez-Chardi, Naroa Serna, Laura Sánchez-García, Eric Voltà-Durán, Ramón Mangues, Antonio Villaverde and Esther Vázquez. Nanostructure Empowers Active Tumor Targeting in Ligand-Based Molecular Delivery. 2019. *Particle and Particle Systems Characterization*. 36: 1900304. **4.194**
- ✓ Julián E. and Noguera-Ortega E. 2019. Bacteria-derived alternatives to live *Mycobacterium bovis* Bacillus Calmette-Guerin for non-muscle invasive bladder cancer treatment. In “Microbial Infections and Cancer Therapy”. Editors: Arsenio M Fialho and Ananda M Chakrabarty. 1st ed, Pan Stanford Publishing Pte. Ltd., Chapter 2. pp: 123-188. ISBN: 9789814774864.
- ✓ Muñoz-Juan A, Carreño A, Mendoza R, Corchero JL. 2019. Latest Advances in the Development of Eukaryotic Vaults as Targeted Drug Delivery Systems. *Pharmaceutics* 28;11(7). **4.733**
- ✓ Villagrasa E, Ferrer-Miralles N, Millach L, Obiol A, Creus J, Esteve I, Solé A. 2019. Morphological responses to nitrogen stress deficiency of a new heterotrophic isolated strain of Ebro Delta microbial mats. *Protoplasma*. 256:105-116. **2.633**

Environmental Microbiology Group

Members

Dr. Antoni Solé (PI)

Dr. Olga Sánchez
Dr. Isabel Esteve
Dr. Núria Gaju
Dr. Marc Llorós
Dr. Maira Martínez
Dr. Jordi Mas
Marc Carrasquilla
Anahita Hosseini
Josune Jimenez
Martí Pla
Denis Rajnovic
Carlota Ruiz
Cristina Sosa
Núria Tomás
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 2019

- ✓ Aguilar L, Gallegos A, Arias CA, Ferrera I, Sánchez O, Rubio R, Ben Saad M, Missagia B, Caro P, Sahuquillo S, Pérez C, Morató J (2019) Microbial nitrate removal efficiency in groundwater polluted from agricultural activities with hybrid cork treatment wetlands. *Science of the Total Environment* 653:723-734
- ✓ Auladell A, Sánchez P, Sánchez O, Gasol JM, Ferrera I (2019) Long-term seasonal and interannual variability of marine aerobic anoxygenic photoheterotrophic bacteria. *The ISME Journal* 13:1975-1987
- ✓ Barba C, Folch A, Gaju N, Sanchez-Vila X, Carrasquilla M, Grau-Martínez A, Martínez-Alonso M (2019) Microbial community changes induced by Managed Aquifer Recharge activities: linking hydrogeological and biological processes. *Hydrology and Earth System Sciences* 23(1):139-154
- ✓ Barba C, Folch A, Sanchez-Vila X, Martínez-Alonso M, Gaju N (2019) Are dominant microbial sub-surface communities affected by water quality and soil characteristics? *Journal of Environmental Management* 237:332-343
- ✓ Ben Saad M, Ben Said M, Sanz-Sáez I, Sánchez O, Morató J, Bousselmi L, Ghrabi A (2019) Enhancement of rhizocompetence in pathogenic bacteria removal of a constructed wetland system. *Water Science and Technology* 79:251-259
- ✓ Llorca M, Castellet-Rovira F, Farré MJ, Jaén-Gil A, Martínez-Alonso M, Rodríguez-Mozaz S, Sarrá M, Barceló D (2019) Fungal biodegradation of the N-nitrosodimethylamine precursors venlafaxine and O-desmethylvenlafaxine in water. *Environmental Pollution* 246:346-356

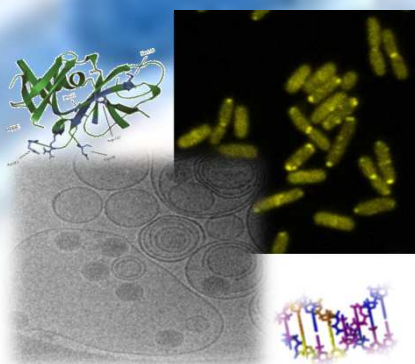
- 
- ✓ Millach L, Villagrasa E, Solé A, Esteve I (2019) Combined confocal laser scanning microscopy techniques for a rapid assessment of the effect and cell viability of *Scenedesmus* sp. DE2009 under metal stress. *Microscopy and Microanalysis* 25(4):998-1003. DOI:10.1017/S143192761901465X
 - ✓ Mir-Tutusa JA, Parladé E, Villagrasa M, Barceló D, Rodríguez-Mozaz S, Martínez-Alonso M, Gaju N, Sarrà M, Caminal G (2019) Long-term continuous treatment of nonsterile real hospital wastewater by *Trametes versicolor*. *Journal of Biological Engineering* 13-47:1-13
 - ✓ Rajnovic D, Muñoz-Berbel X, Mas J. Fast phage detection and quantification: An optical density-based approach. *PLoS ONE* 14(5):e0216292. DOI: 10.1371/journal.pone.0216292
 - ✓ Solé A, Calvo MA, Lora MJ and Sánchez-Chardi A (2019) Electron microscopy techniques applied to bioremediation and biodeterioration studies with moulds: State of the art and future perspectives. Chapter 12. In: Tomasini A and León-Santesteban HH (Eds), *Fungal bioremediation: fundamentals and applications*. CRC Press Taylor & Francis Group, Boca Raton, FL. pp 354-386
 - ✓ Villagrasa E, Ferrer-Miralles N, Millach L, Obiol A, Creus J, Esteve I, Solé A (2019) Morphological responses to nitrogen stress deficiency of a new heterotrophic isolated strain of Ebro Delta microbial mats. *Protoplasma* 256(1):105-116. DOI: 10.1007/s00709-018-1263-8

Molecular Microbiology Group

Members

Dr. Jordi Barbé (PI)

Dr. Montserrat Llagostera
Dr. Susana Campoy
Dr. Jesús Aranda
Dr. Ivan Erill (UBMC)
Dr. M. Pilar Cortés
Jennifer Otero
Miquel Sánchez Osuna
Jordi Corral
Elisabeth Frutos
Júlia López
Gabriela Ortiz
Joan Ruiz
Susana Escribano



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.

Publications 2019

- ✓ Caruso SM, deCarvalho TN, Huynh A, Morcos G, Kuo N, Parsa S, Erill I. 2019. A Novel Genus of Actinobacterial Tectiviridae. *Viruses*. 11:1134. doi: 10.3390/v11121134. (IF 2019: 3,816)
- ✓ Edwards, RA et al. 2019. Global phylogeography and ancient evolution of the widespread human gut virus crAssphage. *Nat Microbiol*. 4(10):1727-1736. doi: 10.1038/s41564-019-0494-6 (IF 2019: 15,540)
- ✓ Giglio M, Tauber R, Nadendla S, Munro J, Olley D, Ball S, Mitraka E, Schriml LM, Gaudet P, Hobbs ET, Erill I, Siegele DA, Hu JC, Mungall C, Chibucos MC. 2019. ECO, the Evidence & Conclusion Ontology: community standard for evidence information. *Nucleic Acids Res*. 47: D1186-D1194. doi: 10.1093/nar/gky1036. (IF 2019: 11,501)
- ✓ Otero J, García-Rodríguez A, Cano-Sarabia M, MasPOCH D, Marcos R, Cortés P, Llagostera M. 2019. Biodistribution of Liposome-Encapsulated Bacteriophages and Their Transcytosis During Oral Phage Therapy. 2019. *Front Microbiol*. 4;10:689. doi: 10.3389/fmicb.2019.00689. (IF 2019: 4,235)
- ✓ Pérez-Varela M, Corral J, Aranda J, Barbé J. 2019. Roles of Efflux Pumps from Different Superfamilies in the Surface-Associated Motility and Virulence of *Acinetobacter baumannii* ATCC 17978. 2019. *Antimicrob Agents Chemother*. 63(3). pii: e02190-18. doi: 10.1128/AAC.02190-18 (IF2019: 4, 904)
- ✓ Sánchez-Osuna M, Cortés P, Barbé J, Erill I. 2019. Origin of the mobile di-hydro-pterolate synthase gene determining sulfonamide resistance in clinical isolates. *Front Microbiol* 10;9:3332. doi: 10.3389/fmicb.2018.03332. (IF 2019: 4,235)
- ✓ Montagut A M, Granados A, Ballesteros A, Pleixats R, Llagostera M, Cortés P, Sebastián R M, Vallribera A. 2019. Antibiotic protected silver nanoparticles for microbicidal cotton. *Tetrahedron*. 75, 1, p. 102-108 (IF 2019: 2,233)

VHIR Research Group of Microbiology

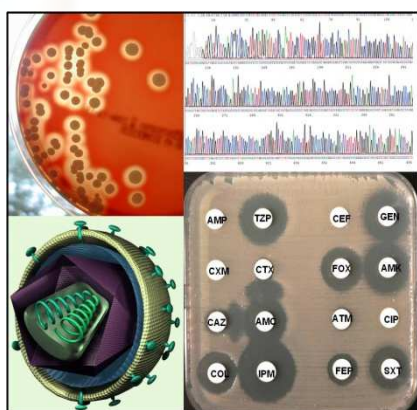
Members

Dr. Tomàs Pumarola Suñé (Group Leader)

Dr. Andres Antón Pagarolas
Dra. Rosa M. Bartolomé Comas
Dra. Estrella Caballero Requero
Dra. Gema Codina Grau
Dra. Juliana Esperalba Esquerra
Dr. Juan José González López
Dra. M. Nieves Larrosa Escartín
Dra. M. Teresa Martín Gómez
Dra. Mayli Lung Suarez
Dra. Elena Sulleiro Igual
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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.

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.

Scientific production (2019)

- 1.- Plantinga N.L., Wittekamp B.H.J., Brun-Buisson C., Bonten M.J.M., Cooper B.S., **Coll P.**, **Lopez-Contreras J.**, Mancebo J., Wise M.P., Morgan M.P.G., Depuydt P., Boelens J., Dugernier T., Verbelen V., Jorens P.G., Verbrugghe W., Malhotra-Kumar S., Damas P., Meex C., Leleu K., van den Abeele A.M., Esteves F., de Matos A.F.G.P., Torres A., Mendez S.F., Gomez A.V., Tomic V., Sifrer F., Tello E.V., Ramos J.R., Aragao I., Santos C., Sperring R.H.M., Coppadoro P., Nardi G. The effects of topical antibiotics on eradication and acquisition of third-generation cephalosporin and carbapenem-resistant Gram-negative bacteria in ICU patients; a post hoc analysis from a multicentre cluster-randomized trial. 2019. *Clinical Microbiology and Infection*. **IF:6.425 Q1D1**
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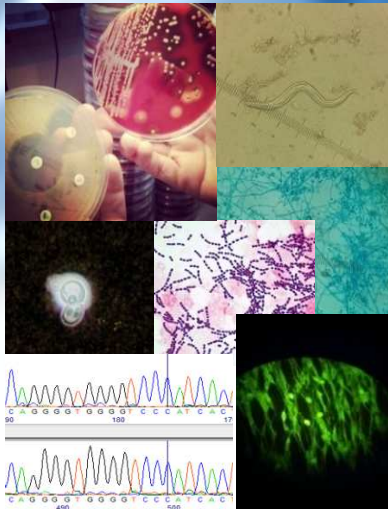
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Research



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 leaded 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 Group¹ 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.



Publicacions 2019

Infecciones por Erythrovirus B19. Seis años de seguimiento en población adulta y pediátrica. **Natàlia Claver Belver, Isabel Sanfeliu Sala, M. Jesús Merino Asensio, Carla Monterde Pedra, Valentí Pineda Solas, Silvia Capilla Rubio, Dionisia Fontanals Aymerich.** *An. Pediatr (Barc)*. 2019;90(5):280-284. **IF:1.166 Q3.**

Protocol de cribratge, Diagnòstic i tractament de la malaltia de chagas en dones embarassades Llatinoamericanes i en els seus fills. Programa de prevenció i control de la malaltia de Chagas congènita a Catalunya Sub-direcció General de Vigilància i Resposta a Emergències de Salut Pública. Col·laboració en la redacció: **I. Sanfeliu.** Agència de Salut Pública de Catalunya. Desembre 2018. <http://canalsalut.gencat.cat/web/.content/AZ/C/chagas/documents/arxiu/protcolcribratgeidiagnostic.pdf>.

NO IF

Relationship between the respiratory microbiome and the severity of airflow limitation, history of exacerbations and circulating eosinophils in COPD patients. Laura Millares, Sergi Pascual, Concepción Montón, Marian García-Núñez, Cristina Lalmolda, Rosa Faner, Carme Casadevall, Laia Setó, **Silvia Capilla**, Amàlia Moreno, Ady Angélica Castro-Acosta, Carlos José Alvarez-Martinez, Oriol Sibila, Germán Peces-Barba, Borja G. Cosio, Alvar Agustí, Joaquim Gea, and Eduard Monsó. *BMC Pulm Med*. 2019; 19: 112. **IF:2.184 Q4**

Discontinuation of dolutegravir, elvitegravir/cobicistat and raltegravir because of toxicity in a prospective cohort. Llibre JM, Montoliu A, Miró JM, Domingo P, Riera M, Tiraboschi J, Curran A, Homar F, Ambrosioni J, Abdulghani N, Force L, Peraire J, Casabona J; PISCIS Cohort group (**Amengual MJ**). *HIV Med*. 2019; 20(3):237-247. doi: 10.1111/hiv.12710. **IF:1.734 Q2**

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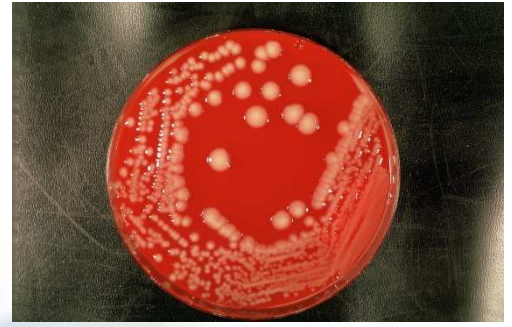
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Genome Instability and DNA Repair Syndromes Group

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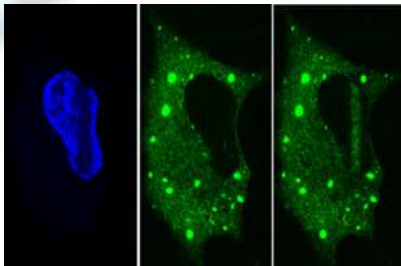
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Research



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.

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Research

Our research field is Evolutionary Biology, a complex historical process that accounts for the current Biodiversity on earth. We seek to understand the mechanisms that generate diversity patterns at several levels: geographical, phenotypical, chromosomal and nucleotide 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 two different species as model systems: *Drosophila* and humans. We are engaged in projects of comparative genomics in *Drosophila*, adaptation of *Drosophila* populations to global climate change, impact of interspecific hybridization on transposable element deregulation, genome-wide analyses of nucleotide and structural variability in a large set of *Drosophila* lines, modelization of the genotype-phenotype map, and functional and evolutionary impact of inversions in the human genome.

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Mutagenesis Group

Members

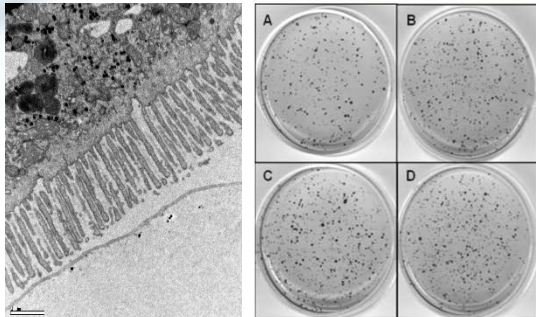
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Research



Our team works on the following topics: (i) molecular mechanisms involved in the genotoxicity/carcinogenicity of arsenic, using long-term exposures and environmental relevant doses; (ii) *In vitro* and *in vivo* models to determine the genotoxic/carcinogenic risk of nanomaterial 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 2019

- ✓ Font-Ribera L., E. Marco, J.O. Grimalt, S. Pastor, R. Marcos, L. Abramsson-Zetterberg, M. Pedersen, T. Grummt, R. Junek, E. Barreiro, D. Heederik, J. Spithoven, R. Critelli, A. Naccarati, C. Schmalz, C. Zwiener, J. Liu, X. Zhang, W. Mitch, L. Arjona, J. de Bont, L. Tarès, P. Vineis, M. Kogevinas, C.M. Villanueva. Exposure to disinfection by-products in swimming pools and biomarkers of genotoxicity and respiratory damage -The PISCINA2 study. *Environmental International*, 131: 104988 (2019). Índex d'impacte: **7,943**.
- ✓ Otero J., A. García-Rodríguez, M. Cano-Sarabia, D. Maspoch, R. Marcos, P. Cortés, M. Llagostera. Biodistribution of liposome-encapsulated bacteriophages and their transcytosis during oral phage therapy. *Frontiers in Microbiology*, 10: 368 (2019). Índex d'impacte: **4,259**.
- ✓ García-Rodríguez A., L. Rubio, L. Vila, N. Xamena, A. Velázquez, R. Marcos, A. Hernández. The comet assay as a tool to detect the genotoxic potential of nanomaterials. *Nanomaterials*, 9: 1385 (2019). Índex d'impacte: **4,034**.
- ✓ García-Rodríguez, A., L. Kazantseva, L. Vila, L. Rubio, A. Velázquez, M.J. Ramirez, R. Marcos, A. Hernández. Micronuclei detection by flow cytometry as a high-throughput approach to test the potential genotoxicity of nanomaterials. *Nanomaterials*, 9: 1677 (2019). Índex d'impacte: **4,034**.

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- ✓ Saez-Tenorio M., J. Domenech, A. García-Rodríguez, A. Velázquez, A. Hernández, R. Marcos, C. Cortés. Assessing the relevance of exposure time in differentiated Caco-2/HT29 cocultures. Effects of silver nanoparticles. *Food and Chemical Toxicology*, 123: 258-267 (2019). Index d'impacte: **3,775**.
- ✓ Recio-Sánchez, G., R. Tighe-Neira, C. Alvarado, C. Inostroza-Blancheteau, N. Benito, A. García-Rodríguez, R. Marcos, H. Presenti. E.R. Carmona. Assessing the effectiveness of green synthesized silver nanoparticles with *Cryptocarya alba* extracts for remotion of the organic pollutant dye methylene blue. *Environmental Science and Pollution Research*, 26(15): 15115-15123 (2019). Index d'impacte: **2,914**.
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- ✓ Alaraby M., S. Romero, A. Hernández, R. Marcos. Toxic and genotoxic effects of silver nanoparticles in *Drosophila*. *Environmental and Molecular Mutagenesis*, 60: 277-285 (2019). Index d'impacte: **2,528**.
- ✓ Arratia F., P. Olivares-Ferretti, A. García-Rodríguez, R. Marcos, E.R. Carmona. Comparative toxic effects of copper-based nanoparticles and their microparticles in *Daphnia magna* by using natural freshwater media. *New Zealand Journal of Marine and Freshwater Research*, 53(3): 460-469 (2019). Index d'impacte: **1,500**.
- ✓ Pastor S., R. Marcos, A. Hernández. Genotoxicity and carcinogenicity of vanadium compounds. En: *An introduction to vanadium: Chemistry, occurrence and applications*. R. Bowell (Ed.). Nova Science Publ. Inc. New York, Chapter 7, pp 187-217 (2019).
- ✓ Annangi B., R. Marcos, A. Hernández. Heavy metals II (arsenic, chromium, nickel, vanadium) and micronuclei. En: *Micronucleus assay in Toxicology*. M Fenech & S. Knasmuelle (Ed.). The Royal Society of Chemistry (London, UK). Chapter 28, pp 450-470 (2019).
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- ✓ Marcos R., E.R. Carmona. The wing-spot and the comet tests as useful assays detecting genotoxicity in *Drosophila*. En: *Genotoxicity Assessment. Methods in Molecular Biology*, A. Dhawan and M. Bajpayee (Eds.), Humana, New York, NY. Vol. 2031, Chapter 19, pp 337-348 (2019).



PhD Thesis 2019

1. Saiz Balbastre, Sandra. “ Development and application of analytical techniques for quality control of biologicals and sterile pharmaceutical products”. Doctorat en Biotecnologia.
2. Sánchez García, Laura. “Engineering all-in-one protein-based nanoparticles for targeted cancer therapies”. Doctorat en Biotecnologia.
3. Rubio Bueno, Marc. “Taxonomy, basis of resistance and molecular epidemiology of the mycobacterium abscessus complex ”. Doctorat en Microbiologia.
4. Esteban Marcos, Irene. “ Aplicación clínica de los paneles de genes de la susceptibilidad al cáncer: caracterización de variantes en genes de riesgo e impacto psicológico”. Doctorat en Genètica.
5. Leno Colorado, Jorge. “Effect of domestication in the pig genome”. Doctorat en Genètica.
6. Chocarro Ruíz, Blanca. “Development of bimodal waveguide interferometric sensors for environmental monitoring”. Doctorat en Biotecnologia.
7. Sulleiro Igual, Elena. “ Aplicación de las técnicas moleculares en el diagnóstico y seguimiento de pacientes con enfermedad de Chagas crónica en un área no endémica”. Doctorat en Microbiologia.
8. Alfonso Pérez, Gerardo. “Bayesian neural networks to predict aging and disease risk”. Doctorat en Genètica.
9. Arias de la Cruz, Lilibeth. “ Factores que modifican el desarrollo y la progresión de la tuberculosis: obesidad, multiinfección y cording ”. Doctorat en Microbiologia.
10. Otero Carrera, Jennifer. “Biodistribution of bacteriophages in mammals after oral phage therapy and the emergence of bacterial resistance to phages”. Doctorat en Microbiologia.
11. Andrés Vergés, Cristina. “Los picornavirus. De la levedad a la gravedad”. Doctorat en Microbiologia.
12. Rodríguez Fernández, Pablo. “In vitro effects of pollutants and novel therapeutic approaches for tuberculosis”. Doctorat en Microbiologia.
13. Villar Hernández, Raquel. “Towards a better diagnosis of mycobacterial infections. IGRAs and beyond”. Doctorat en Microbiologia.
14. Morales Segovia, Brian. “ Identificación de la microbiota genital de perros. Evaluación del potencial probiótico de las bacterias ácido lácticas”. Doctorat en Microbiologia.
15. Lerga Jaso, Ion. “Integrative analysis of the functional consequences of inversions in the human genome”. Doctorat en Genètica.



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