

## Genetic stability



### Description

Our group is devoted to analyze the factors that govern genetic stability in bacteria and the mechanisms of horizontal gene transfer, using *Bacillus subtilis* and the bacteriophage SPP1 as the models.

### Members of the group

Juan Carlos Alonso  
Silvia Ayora  
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### Research topics

Homologous recombination. Our research focuses in: i) analyzing the proteins that control the RecA recombinase, as DisA, RadA, PcrA, and RecD2; and ii) analyze how recombination proteins may participate in the process of replication restart after fork stalling or fork collapse

Natural competence. We analyze: i) the mechanisms and recombination proteins responsible for the acquisition of interspecies DNA, and ii) the impact of chromosome structure in the acquisition of interspecies DNA

Bacteriophages We are analyzing: (i) how bacteriophages may contribute to the acquisition of antibiotic resistances; (ii) phage SPP1 DNA replication as a model of recombination-dependent replication

Segregational stability. We study how toxin-antitoxin systems contribute to segregations stability using plasmid pSM19035 as a model.

### **Research projects:**

Molecular analysis of the interrelation between repair by recombination, replication and horizontal gene transfer in *Bacillus subtilis*. PGC2018-097054-B-I00. 1/1/2019-30/09/2022. PIs: Silvia Ayora & Juan C. Alonso.

### **Recent articles**

Torres R, Alonso JC. *Bacillus subtilis* RecA, DisA, and RadA/Sms Interplay Prevents Replication Stress by Regulating Fork Remodeling. *Front Microbiol.* 12:766897. doi: 10.3389/fmicb.2021.766897 (2021).

Gándara C, Torres R, Carrasco B, Ayora S, Alonso JC. DisA Restrains the Processing and Cleavage of Reversed Replication Forks by the RuvAB-RecU Resolvasome. *Int J Mol Sci.* 22(21):11323. doi: 10.3390/ijms222111323 (2021)

Labarde A, Jakutyte L, Billaudeau C, Fauler B, López-Sanz M, Ponien P, Jacquet E, Mielke T, Ayora S, Carballido-López R, Tavares P. Temporal compartmentalization of viral infection in bacterial cells. *Proc Natl Acad Sci U S A.* 118(28):e2018297118. doi: 10.1073/pnas.2018297118 (2021).

Serrano E, Torres R, Alonso JC. Nucleoid-associated Rok differentially affects chromosomal transformation on *Bacillus subtilis* recombination-deficient cells. *Environ Microbiol.* 23(6):3318-3331. doi: 10.1111/1462-2920.15562 (2021).

Torres R, Gándara C, Carrasco B, Baquedano I, Ayora S, Alonso JC. DisA Limits RecG Activities at Stalled or Reversed Replication Forks. *Cells.* 10(6):1357. doi: 10.3390/cells10061357 (2021).

Moreno-Del Álamo M, Carrasco B, Torres R, Alonso JC. *Bacillus subtilis* PcrA Helicase Removes Trafficking Barriers. *Cells.* 10(4):935. doi: 10.3390/cells10040935 (2021).

Cerminati S, Leroux M, Anselmi P, Peirú S, Alonso JC, Priem B, Menzella HG. Low cost and sustainable hyaluronic acid production in a manufacturing platform based on *Bacillus subtilis* 3NA strain. *Appl Microbiol Biotechnol.* 105(8):3075-3086. doi: 10.1007/s00253-021-11246-6. (2021).

Serrano E, Ramos C, Alonso JC, Ayora S. Recombination proteins differently control the acquisition of homeologous DNA during *Bacillus subtilis* natural chromosomal transformation. *Environ Microbiol.* 23(1):512-524. doi: 10.1111/1462-2920.15342 (2021).

Alonso JC. Toxin-Antitoxin Systems in Pathogenic Bacteria. *Toxins (Basel)* 13(2):74. doi: 10.3390/toxins13020074 (2021).

Moreno-Del Álamo M, Marchisone C, Alonso JC. Antitoxin  $\epsilon$  Reverses Toxin  $\zeta$ -Facilitated Ampicillin Dormants. *Toxins (Basel)*. 12(12):801. doi: 10.3390/toxins12120801 (2020).

Moreno-Del Alamo M, Torres R, Manfredi C, Ruiz-Masó JA, Del Solar G, Alonso JC. *Bacillus subtilis* PcrA Couples DNA Replication, Transcription, Recombination and Segregation. *Front Mol Biosci*. 7:140. doi: 10.3389/fmolb.2020.00140 (2020).

Serrano E, Ramos C, Ayora S, Alonso JC. Viral SPP1 DNA is infectious in naturally competent *Bacillus subtilis* cells: inter- and intramolecular recombination pathways. *Environ Microbiol*. 22(2):714-725. doi: 10.1111/1462-2920.14908 (2020).

Romero H, Serrano E, Hernández-Tamayo R, Carrasco B, Cárdenas PP, Ayora S, Graumann PL, Alonso JC. *Bacillus subtilis* RarA Acts as a Positive RecA Accessory Protein. *Front Microbiol*. 11:92. doi: 10.3389/fmicb.2020.00092 (2020).

### **Doctoral Thesis:**

Ruben Torres (2019). *Bacillus subtilis RadA/Sms and RecA contribute in concert to double-strand break repair and natural transformation, and with DisA to DNA damage tolerance*. Supervisor: Juan C. Alonso. Universidad Autónoma de Madrid

Ester Serrano (2018) *Bacillus subtilis RecA accessory proteins at the stage of homology search during natural transformation*. Supervisor: Juan C. Alonso. Universidad Autónoma de Madrid

Hector Romero (2018) *Single-molecule Dynamics in Protein Interactions: Characterization of RarA and RecD2 of Bacillus subtilis*. Universität Marburg (Germany). Supervisors: Juan C. Alonso & Peter L. Graumann.

### **webpage**

<http://www.cnb.csic.es/index.php/es/investigacion/departamentos-de-investigacion/biotecnologia-microbiana/estabilidad-genetica>