

Daniel Martínez Martínez

PHD, RESEARCH ASSOCIATE · SYSTEMS BIOLOGY, MICROBIOME, DATA SCIENCE

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Education

University of Valencia

Valencia, Spain

B.S. IN BIOLOGICAL SCIENCES

Sep. 2006 - Jun 2011

- Five-year degree in biology. Main specialisation in cell biology, biochemistry, microbiology and evolution.

University of Valencia

Valencia, Spain

MSC IN MOLECULAR, CELLULAR AND GENETIC BIOLOGY

Sep. 2011 - Sep 2012

- Specialisation in genetics and evolutive biology.

University of Valencia

Valencia, Spain

DOCTORATE DEGREE IN BIOMEDICINE AND BIOTECHNOLOGY

Sep. 2012 - Jan. 2019

- PhD program in Biomedicine and Biotechnology.
- Supervisors: Andrés Moya Simarro and Carlos Peña Garay

Experience

Cavanilles Institute of Evolutionary Biology (ICBiBE)

Valencia, Spain

MASTER THESIS

Feb. 2012 - Sep. 2012

- **MSc Research Project:** 'Uric acid metabolism in *Blattella germanica*: responses to diets with different nitrogen concentration'. The master thesis was aimed to study the relationship between the cockroach *Blattella germanica* and its endosymbiont *Blattabacterium cuenotii* in the use of Nitrogen compounds.
- Techniques learned: work with animal models, DNA and RNA extraction, PCR, cDNA synthesis, rt-PCR, data analysis.
- Supervisor: Prof. Dr. Dr. Andrés Moya Simarro

Albert Einstein College of Medicine

New York City, USA

SHORT STAY

May. 2016 - Aug. 2016

- Short Stay at the department of *Computational and Systems Biology*. I focused on the study of microbial interactions based on the system of differential equations of the generalized Lotka-Volterra model.
- Supervisor: Dr. Aviv Bergman

Institute for Integrative Systems Biology (I2SysBio)

Valencia, Spain

PHD THESIS

Sep. 2012 - Jan. 2019

- **Thesis Research Project:** *Stability of the human microbiome. Health and disease related to the time variability in the human microbiome.* The main topic of my PhD project was to define the stability of microbiota with a mathematical model based on Taylor's Law, and how it is related to human health. The tools generated have been used to study the relationship between stability and health: on a case regarding a set of children suffering from acute infectious diarrhoea, sampling their gut microbiomes; and on another case involving a set of oral microbiome samples to study the importance of oxidative stress markers. Furthermore, the thesis has a theoretical objective for the study of noise-induced experiments for microbial interactions inference, entirely developed *in silico*.
- Supervisors: Prof. Dr. Dr. Andrés Moya Simarro and Dr. Carlos Peña Garay

LMS London Institute of Medical Sciences

London, United Kingdom

POSTDOC

Oct. 2018 - currently

- **Research Projects:** During this period, my aim has been to delve into the mechanisms that govern microbe-host interactions. I've been leading the research in different projects by developing all the computational pipelines for data analysis as well as getting involved in the experimental part. I have investigated how diet and the microbiota influence cancer drug efficacy in *C. elegans*, and how the findings were translated to human cell lines; I have also investigated the relationship between the complex genetics from the *E. coli* pangenome (comprising more than 800 strains) and host phenotype in the context of metformin treatment, revealing a fascinating landscape of genetic cues that affects host phenotype; and a project in which I've used deep learning techniques to unveil the fine mechanisms of metformin effect inside the cells. Besides these projects, I've been involved in many other collaborations from within and outside our group. During these years I've developed a strong sense of responsibility, being more independent and having an active impact on all the projects I've been involved with.
- Supervisor: Prof. Dr. Filipe Cabreiro

Safety Supervisor

SAFETY SUPERVISOR

London, UK

Jan. 2019 - currently

- Safety Supervisor of the Cabreiro lab. I am responsible for the safety training for every new person that comes to the lab. Responsible of keeping all safety documentation (risk assessment, code of practice) up to date and available for every lab member.

Conferences and talks

I Congress of PhD students of Biomedicine in Valencia

Valencia, Spain

POSTER AND SHORT PRESENTATION: *Microbiota: are you sick?*

Nov. 2014

- Poster and short presentation of the project *Microbiota: are you sick?*, related to the study of microbial stability over time.

II Congress of PhD students of Biomedicine in Valencia

Valencia, Spain

POSTER: *Cyclic time variations in human microbiome*

Nov. 2015

- Poster about the project *Cyclic time variations in human microbiome*, in which we studied the characteristic cycles of the microbiota in healthy humans using Least-squares spectral analysis.

I Congress of Critical Thinking and Science Communication.

Valencia, Spain

SPEAKER: *ULŪM*

Apr. 2016

- Long presentation of ULŪM's project, focused on science communication.

V National Congress of Evolutionary Biology

Murcia, Spain

SPEAKER: *Health and disease imprinted in the time variability of the human microbiome*

Jan. 2016

- Presentation of the project *Health and disease imprinted in the time variability of the human microbiome*, related with the temporal stability of the microbiota.

XIII Symposium on Bioinformatics

Valencia, Spain

POSTER: *Temporal stability of the salivary microbiome and its correlation with oxidative markers.*

May 2016

- Poster of the project *Temporal stability of the salivary microbiome and its correlation with oxidative markers*, related to the study of oral microbial dynamics in healthy volunteers related to oxidative stress markers.

I National Congress of young researchers in Biomedicine. III Congress of PhD students of Biomedicine in Valencia.

Valencia, Spain

POSTER: *Individual-specific bacterial communities involved in the infection processes in the oral cavity.*

Nov. 2016

- Poster of the project *Individual-specific bacterial communities involved in the infection processes in the oral cavity*, related to the study of the microbial dynamics in healthy volunteers.

Federation of European Microbiological Societies (FEMS), 7th Congress.

Valencia, Spain

POSTER: *Health and disease imprinted in the time variability of the human microbiome.*

Jul. 2017

- Poster of the project *Health and disease imprinted in the time variability of the human microbiome*, summarising all the results that were published in the *mSystems* journal.

ELSI Origins of Life EON

Tokyo, Japan

PRESENTATION: *Application of Taylor's Law to community ecology*

Jul. 2017

- Presentation of the Taylor's law related to its use in the community ecology field, associated to the study of communities in early stages of life

LMS Chemistry Mixer

London, UK

PRESENTATION: *Metabolites at the interface of Microbe-Host physiology*

Jun. 2019

- Presentation of our group expertise in studying the interaction between host and microbes from a mechanistic point of view.

EMBO YIP

London, UK

PRESENTATION: *Exploring the BGC potential in the E. coli pangenome*

Oct. 2021

- Short talk in the EMBO YIP sectoral meeting on Evolution.

Pharmacogenetics and Stratified Medicine Network

London, UK

PRESENTATION: *Microbiome in drug response: navigating the genetic landscape of the E. coli pangenome*

Jun. 2022

- 20 min talk at the UKPGx2022 meeting.

Extracurricular Activity

Evolution of Biosphere: Origins of life and life in space

Banyuls sur Mer, France

STUDENT

Jun. 2010

- Erasmus course about the Origin of Life and Life in Space organized by the University of Valencia, University of Nottingham, University of Bonn, University of Florence, and the Marie Curie University

Statistical Methods to predict complex characteristics using genetic information

Valencia, Spain

STUDENT

Apr. 2013

- Course on Bayesian statistics imparted by Daniel Gianola at Polytechnic University of Valencia.

II Congress of PhD students of Biomedicine in Valencia.

Valencia, Spain

MEMBER OF THE ORGANIZING COMMITTEE

Nov. 2015

- Member of the organizing committee, within a multidisciplinary team formed by other PhD students from other laboratories.

Workshop DULIA-bio (Deep Underground Laboratory Integrated Activity in biology)

Canfranc, Spain

STUDENT

Oct. 2015

- Workshop on the state-of-the-art science and technology about the study of life at low depths.

I National Congress of young researchers in Biomedicine. III Congress of PhD students of Biomedicine in Valencia.

Valencia, Spain

MEMBER OF THE ORGANIZING COMMITTEE

Nov. 2016

- Member of the organizing committee, within a multidisciplinary team formed by other PhD students from other laboratories.
- This year, we broaden the scope of the conference to a national level.

II National Congress of young researchers in Biomedicine. IV Congress of PhD students of Biomedicine in Valencia.

Valencia, Spain

MEMBER OF THE ORGANIZING COMMITTEE

Nov. 2017

- Member of the organizing committee, within a multidisciplinary team formed by other PhD students from other laboratories.
- We continued growing, becoming an important Conference at national level.

ULÛM (Magazine of Science Communication)

Valencia, Spain

EDITOR AND CO-FOUNDER

Sep. 2014 - currently

- ULÛM is digital magazine for scientific communication, which not only focus its efforts in technical publications but also in other minor fields as science fiction, passion, history and rigorous criticism.

Publications

1. **Martínez-Martínez D***, Rossi M*, Amaretti A, Ulrici A, Raimondi S, Moya A. 2016. Mining metagenomic whole genome sequences revealed subdominant but constant *Lactobacillus* population in the human gut microbiota. *Environmental Microbiology reports* 8:399-406.
2. **Martínez-Martínez D***, Martí JM*, Rubio T, Gracia C, Peña M, Latorre A, Moya A, P. Garay C. 2017. Health and Disease Imprinted in the Time Variability of the Human Microbiome. *mSystems* 2:e00144-16.
3. **Martínez-Martínez D***, Dinleyici EC*, Kara A, Karbuz A, Dalgic N, Metin O, Yazar AS, Guven S, Kurugol Z, Turel O, Kucukkoc M, Yasa O, Eren M, Ozen M, Martí JM, Garay CP, Vandenplas Y, Moya A. 2018. Time series analysis of the microbiota of children suffering from acute infectious diarrhea and their recovery after probiotic treatment. *Frontiers in Microbiology*. doi.org:10.3389/fmicb.2018.01230
4. **Martínez-Martínez D***, Dzunkova M*, Gardlík R, Behuliak M, Jansakova K, Jiménez N, Vázquez-Castellanos JF, Martí JM, D'Auria G, Bandara HMHN, Latorre A, Celec P, Moya A. 2018. Oxidative stress in the oral cavity is driven by individual-specific bacterial communities. *NPJ biofilms and microbiomes*. doi.org/10.1038/s41522-018-0072-3
5. Pryor R, Norvaisas P, Marinos G, Best L, Thingholm LB, Quintaneiro L, De Haes W, Esser D, Waschina S, Lujan C, Smith RL, Scott TA, **Martínez-Martínez D**, Woodward O, Bryson K, Laudes M, Lieb W, Houtkoooper RH, Franke A, Temmerman L, Bjedov I, Cochemé HC, Kaleta C, Cabreiro F. 2019. Host-microbe-drug-nutrient screen identifies bacterial effectors of metformin therapy. *Cell*. doi.org/10.1016/j.cell.2019.08.003
6. Pryor R, **Martínez-Martínez D**, Quintaneiro L, Cabreiro F. 2019. The role of the microbiome in drug response. *Annual review of pharmacology and toxicology*. doi.org/10.1146/annurev-pharmtox-010919-023612
7. Essmann C, **Martínez-Martínez D**, Pryor R, Leung K, Krishnan KB, Lui PP, Greene N, Brown A, Pawar V, Srinivasan M, Cabreiro F. 2020. Mechanical properties measured by atomic force microscopy define health biomarkers in ageing *C. elegans*. *Nature communications*. doi.org/10.1038/s41467-020-14785-0
8. Liu Y, **Martínez-Martínez D**, Essmann C, Cruz MR, Cabreiro F, Garsin DA. 2021. Transcriptome analysis of *Caenorhabditis elegans* lacking heme peroxidase SKPO-1 reveals an altered response to *Enterococcus faecalis*. *G3*. doi.org/10.1093/g3journal/jkaa055
9. **Martínez-Martínez D***, Backes C*, Cabreiro F. 2021. *C. elegans*: A biosensor for host-microbe interactions. *Nature Lab Animal*. doi.org/10.1038/s41684-021-00724-z

- 10. Ceci A, Munoz-Ballester C, Tegge A, Brown KL, Umans RA, Michel FM, Patel D, Tewari B, Martin J, Alcoreza O, Maynard T, **Martínez-Martínez D**, Bordwine P, Bissell N, Friedlander M, Sontheimer H, Finkielstein CV. 2021. Development and Implementation of a scalable and versatile test for COVID-19 diagnostics in rural communities. *Nature Communications*. doi.org/10.1038/s41467-021-24552-4
- 11. Martínez-Miguel VE, Lujan C, Espie-Caullet T, **Martínez-Martínez D**, Moore S, Backes C, Gonzalez S, Galimov E, Brown A, Halic M, Tomita K, Rallis C, von der Harr T, Cabreiro F, Bjedov I. 2021. Increased fidelity of protein synthesis extends lifespan. *Cell Metabolism*. doi.org/10.1038/s41467-021-24552-4

• *: equal contribution

Grants

Earth-Life Science Institute Origins Network (ELSI-EON) Seed Grant, Grant to support innovative high-risk/high-reward research projects on the origins of life problem. Our project aimed the study of phase transitions in chemical reaction networks.

Tokyo, Japan

Master thesis tutored

Title: Inferencia de metabolomas a partir de datos de metagenómica

Valencia, Spain

NAME: ALEJANDRA REY MARIÑO

Sep. 2016

- Master thesis project aimed to test the inference of metabolomes from 16S microbiome data. Tutors: Andrés Moya Simarro and Daniel Martínez Martínez.

Computational skills

Programming languages

Basic	Mathematica
Intermediate	MATLAB, Julia
Advanced	R, Python

Computational skills

Skills Windows, Mac, Linux systems, Bash, \LaTeX , High Performance Computing (HPC), GitHub

Bioinformatics

Microbial ecology	16S analysis, WGS metagenomics, functional analysis, community dynamics, metabolic models
Evolutionary biology	Phylogenetic reconstruction, database mining (NCBI, InterPro, etc), pangenome analysis, mGWAS analysis
multi-omics	RNA-seq, metabolomics and proteomics data analysis pipelines; Perseus, Metaboanalyst, multi-omics integration

Data analysis

General skills	tidyverse, pandas, numpy, matplotlib, Jupyter and Google Colab Notebooks
Machine Learning	tidymodels, scikit-learn
Deep Learning	Keras, Tensorflow 2.X, PyTorch (basic knowledge)

Laboratory skills

Animal Handling

Blattella germanica	Maintenance, crossing, and dissection of several organs/tissues from the subject
Caenorhabditis elegans	Lines maintenance, phenotypic scoring with COPAS, egg preparations and population synchronization, generation of new lines by crossing, fluorescent microscopy, RNA extraction

Microbiology

General skills	Strain library maintenance, culture of anaerobic strains in the anaerobic chamber, PCR, plasmid transformation, transduction, generation of single and multiple mutant strains, DNA and RNA extraction, sequencing, Biolog characterization
Molecular biology	

Other

General skills	Maintenance of laboratory solutions, laboratory safety measures, lab automation with Opentrons
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Languages

Mothertongue	Spanish, Catalán
Proficient	English
Advanced	Portuguese
Basic	Japanese