



# **Borja Barbero Barcenilla**

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## **A. Education**

INSTITUTION AND LOCATION	DEGREE	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
IONA college	BS*	09/2011	12/2012	Biochemistry
University of Delaware, Newark, DE	BS	12/2012	06/2015	Biochemistry
Texas A&M University, College Station, TX	PHD	09/2015	Present	Biochemistry

## **B. Skills**

Nucleic acid extraction (RNA-DNA)  
Q-PCR  
TapeStation  
Southern blot  
Western blot  
Protein assays  
Protein purification

Genome sequencing  
Python  
Microscopy  
HPLC  
Mass spectrometry  
Plant biology  
Protein expression

Oxford Nanopore  
Matlab  
Galaxy  
RNAseq  
CHIP  
CRISPR  
Gene editing

## **B. Positions and Honors**

### **Positions and Employment**

2014,05 – 2015,06 Undergraduate Research Fellow, University of Delaware Advisors: Dr. Catherine Grimes  
2005,09 – 2007,01 Undergraduate Teaching/Research, University of Delaware Advisor: Dr. Catherine Grimes  
2016,01 – Present Graduate Teaching/Research Assistant, Texas A&M University, Biochemistry and biophysics department. Advisor: Dr. Dorothy E. Shippen

### **Other Experience and Professional Memberships**

2011 – 2015 NCAA div1 Student Athlete, Soccer, IONA college & University of Delaware  
2017 – 2018 Biochemistry Graduate Student Association (BGA) officer, Graduate and Recruiting Admissions Committee, Texas A&M University  
2018 – 2019 Judge coordinator, Student Research Week, Texas A&M University  
2019 Organizer 1<sup>st</sup> Biochemistry and Biophysics graduate student research symposium, Texas A&M University  
2019 OGAPS blog ambassador program  
2020 Volunteer organizer 1<sup>st</sup> Virtual Science Career Fair, Texas A&M University

### **Honors**

2017 Finalist 25th oral presentation Biochemistry and Biophysics graduate research symposium, Texas A&M University  
2017 2<sup>nd</sup> place 20<sup>th</sup> annual Student Research Week graduate oral presentation, Texas A&M University.  
2017 3<sup>rd</sup> place 22<sup>nd</sup> annual College of Medicine Graduate research symposium (COMGSO), Texas A&M University  
2019 2<sup>nd</sup> place OGAPS Blog ambassador program, Texas A&M University

## **Teaching and Mentorship**

2014,09 – 2015,05 Teaching Assistant, introductory biochemistry, University of Delaware.  
2016,09 – 2018,05 Teaching assistant, Biochemistry upper level class and laboratory, Texas A&M University.  
2017,01 – Present Mentor undergraduate researchers, Texas A&M University

### C. Contributions to Science

**Early Career:** At the University of Delaware, I did research for Dr. Catherine Grimes. The goal of my research was the purification and enzymatic assay of different Mur enzymes in peptidoglycan biosynthesis in order to remodel the bacteria cell wall. Therefore, I learned different cloning and protein purification techniques of different Mur constructs. Those constructs were then used by the rest of the Grimes lab in studying the different interactions of these molecules with NOD receptors in Chron's disease.

In the lab of Dr. Grimes, there was an interface between different fields of chemistry and biology. In order to succeed on my project, I needed tight collaboration with different undergraduate, graduate and post-doctoral students with different scientific backgrounds. These further promoted early scientific communication and lab social skills. As well, in the Grimes lab it was common for undergraduate researchers to present on lab meetings monthly.

**Graduate Career:** My work as a graduate student, under the guidance of Dr. Dorothy Shippen, has been focused on the characterization of *Arabidopsis thaliana* Protection Of Telomeres 1b (POT1b) protein, discovered back in 2005, but still with an unknown function. Most POT1 like genes in plants and mammals are single copy, with different duplications observed in different organism that give rise to interesting functions outside of its characteristic role at chromosome ends. The POT1 gene in the early diverging land plant *Physcomitrella patens* retains the ancestral characteristic functions of binding single-stranded G-rich telomeric DNA and protecting chromosome ends from fusion. However, at least two independent POT1 duplications occurred in higher plants, one in the grasses and one in the Brassicaceae family to which *Arabidopsis thaliana* belongs.

On the first year of my project, I was able to create a POT1b null mutant using CRISPR-Cas9 system, that showed different phenotypes than AtPOT1a, suggesting a minor role at chromosome ends under normal conditions. Since then, with a variety of genetic and biochemical assays, we are hypothesizing a new role of POT1b under oxidative stress. Due to the nature of telomere repeats, chromosome ends are highly susceptible to Reactive Oxygen Species (ROS), and therefore the lack of POT1b under different oxidative damage scenarios has an effect on the overall plant morphology and telomeres. With advancements on the field, new and exciting research shows a intimate connection between telomere accessory proteins and oxidative damage.

In line of this research and on a collaboration with Tom Juenger' lab at UT Austin, the effect of different stresses at chromosome ends has been studied on different genetic backgrounds. Telomere dynamics is a useful parameter in the context of ecology and evolution research as a readout of organismal response to environmental and other stress types. On that collaboration, we applied a multifaceted approach to further extend our current understanding of the evolutionary and ecological bases of the interplay between telomere biology and environment. Specifically, we used as a reference Col-0 genotype and various mutant lines in this background to re-create two environmental stress conditions (high temperature and drought) and analyze corresponding changes in telomere dynamics and fitness parameters, all in the laboratory settings.

- a. Barcenilla, BB, Shippen, DE. Back to the future: the intimate and evolving connection between telomere-related factors and genotoxic stress. J. Biol. Chem. 2019; doi: Pubmed [PMID:31434740](https://pubmed.ncbi.nlm.nih.gov/31434740/)
- b. Shakirov, E, Barcenilla, BB et al.,. Natural population-specific telomere length set point has important implications for plant physiology and response to environmental stress factors in *Arabidopsis thaliana* (in prep)
- c. Barcenilla, BB, Castillo,C ,Shippen,DE et al.,.Characterization of AtPOT1b role in oxidative stress
- d. Barcenilla, BB, Shippen, DE et al, Synergistic role of AtTERT and AtPOT1b in plant development pathways.

**D. Additional Information: Research Support and/or Scholastic Performance**

YEAR	COURSE TITLE	GRADE
TEXAS A&M UNIVERSITY		
2015	General Biochemistry	B
2015	Critical Analysis of Biochemistry Literature	A
2015	Methods of Biochemical Analysis	B
2016	Biochemical Genetics	B
2016	Biophysics	B
2016	Journal Club: Nucleic Acid-Protein interactions	A
2016-2019	Journal Club: Plant Biochemistry & Genomics	A
2016	Genomics	B
2016	Building Scientific Relationships	A
2017	Journal Club: Protein folding and stability	A
2017	Plant Molecular Biology	A

YEAR	COURSE TITLE	GRADE
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The grading system a University of the Andes is as indicated below, passing with a score of 3.0 or higher\*.

1.0 Exceptional	3.0 Acceptable
4.5 Very Good	2.5 Deficient / Fail
4.0 Good	2.0 Bad
3.5 Fair	1.5 Minimum

\* I finished the undergraduate program with the second highest GPA (out of 32) my class.