HUMAN HOST DEFENCE RNASES
ESTER BOIX BORRÁS

PROFILE

Ester Boix is leading the research group on “Human host defence RNases” at the Universitat Autònoma de Barcelona, Spain. Following postdoctoral studies at the National Institutes of Health, Bethesda, USA, and at the University of Bath, UK, she was awarded in 2002 with a Ramon y Cajal senior researcher contract and is currently Full Professorship accredited. She has been awarded 7 research projects as Principal Investigator and has published more than 70 papers in peer-review journals. Her research group has contributed to the structural characterization of human RNases by X-ray crystallography and the identification of RNases host defence properties. Current work is focused on the identification of RNA recognition patterns and structure-based design of novel antimicrobial agents to combat bacterial resistance.

RESEARCH

RESEARCH INTERESTS

Our lab is working on the development of novel antibiotics based on the structure-functional knowledge of human RNases that participate in the innate immune response.

STRATEGIC OBJECTIVES

Human secretory RNases are key players of the host immunity and contribute to maintain the body fluids' sterility. They are activated upon a diversity of cellular stress injuries and mediate signaling processes, classified therafter as alarmins. Interestingly, secreted RNases can shape the non-coding RNA population and participate thereby in the host innate immune response.

We are currently exploring both the immuno-modulation and anti-infective activities of human canonical RNases. Structural- functional analysis is applied in the design and engineering of new scaffolds to develop novel antibacterial and antiviral agents. In particular, we are aiming to target microbial resistance forms, such as biofilm communities and macrophage dwelling pathogens.

MAIN RESEARCH LINES

-Mechanism of action of human Antimicrobial RNases

-Search for recognition patterns for pathogen RNA targeting.

-Characterization of RNase activities on single- stranded RNA viruses

-Search for novel antibiotics to fight antimicrobial resistance

LAB FEATURED PUBLICATIONS:

Abengózar MÁ, Fernández-Reyes M, Salazar VA, Torrent M, de la Torre BG, Andreu D, Boix E, Rivas L. Essential Role of Enzymatic Activity in the Leishmanicidal Mechanism of the Eosinophil Cationic Protein (RNase 3). *ACS Infect Dis*. (2022) 8(7):1207-1217. https://pubs.acs.org/doi/10.1021/acsinfecdis.1c00537

Lu L, Li J, Wei R, Guidi I, Cozzuto L, Ponomarenko J, Prats-Ejarque G and **Boix** Selective cleavage of ncRNA and antiviral activity by RNase2/EDN in THP1-induced macrophages *Cell Mol Life Sci* (2022) 79:209 https://link.springer.com/article/10.1007/s00018-022-04229-x

Prats-Ejarque G, Lorente H, Villalba C, Anguita R, Lu L, Vázquez-Monteagudo S, Fernández-Millán P, **Boix E.** Structure-Based Design of an RNase Chimera for Antimicrobial Therapy. *Int J Mol Sci*. (2022) 23(1):95. doi: 10.3390/ijms23010095.

Li J. and Boix E. Host Defense RNases as Antiviral agents against enveloped single-stranded RNA Viruses. *Virulence* (2021) 12:1, 444-469. https://doi.org/10.1080/21505594.2021.1871823

Lu, L., Wei, R., Prats-Ejarque, G. Goetz, M, Torrent M & Boix E. Human RNase3 immune modulation by catalytic-dependent and independent modes in a macrophage-cell line infection model. *Cell. Mol. Life Sci.* (2021). https://doi.org/10.1007/s00018-020-03695-5

Prats-Ejarque G, Lu L, Salazar VA, Moussaoui M, Boix E. Evolutionary Trends in RNA Base Selectivity Within the RNase A Superfamily. *Front Pharmacol.* 2019 Oct 9;10:1170. https://doi.org/10.3389/fphar.2019.01170

Lu L, Arranz-Trullén J, Prats-Ejarque G, Pulido D, Bhakta S, Boix E. Human Antimicrobial RNases Inhibit Intracellular Bacterial Growth and Induce Autophagy in Mycobacteria-Infected Macrophages. *Front Immunol*. 2019 Jul 2;10:1500.https://doi.org/10.3389/fimmu.2019.01500

Prats-Ejarque G, Li J, Ait-Ichou F, Lorente H, Boix E. Testing a Human Antimicrobial RNase Chimera Against Bacterial Resistance. *Front Microbiol.* 2019 Jun 19;10:1357. https://doi.org/10.3389/fmicb.2019.01357

Prats-Ejarque G, Blanco JA, Salazar VA, Nogués VM, Moussaoui M, Boix E. Characterization of an RNase with two catalytic centers. Human RNase6 catalytic and phosphate-binding site arrangement favors the endonuclease cleavage of polymeric substrates. *Biochim Biophys Acta Gen Subj*. 2019 Jan;1863(1):105-117. https://doi.org/10.1016/j.bbagen.2018.09.021

Lu L, Li J, Moussaoui M and Boix E Immune modulation by human secreted RNases at the extracellular space. *Front Immunol* (2018) 8:1499. 1-17 https://doi.org/10.3389/fimmu.2018.01012