Universitat Pompeu Fabra Barcelona | Master in Bioinformatics for Health Sciences

Master project 2021-2022

Personal Information

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Project

Computational genomics

Project Title:

Exploring the small transcriptome (sRNAs) in neurodegenerative diseases

Keywords:

small RNA, extracellular vesicles, neurodegenerative disaese, deregulation patterns, biomarkers

Summary:

Circulating microRNAs have proven to be reliable biomarkers of disease, due to their high stability, in vivo in the circulation. Most studies are focused in miRNA profiling in whole blood, plasma serum and more recently in extracellular vesicles (exosomes). The composition of the small RNA transcriptome is more complex than anticipated and other species strongly perturbed in disease status, including snoRNAs and tRNA fragments, may provide a novel source of bioactive compounds with potential as diagnostic and prognostic biomarkers. The objective of this project is to analyze the sRNA transcriptome in different blood compartments (plasma and/or EVs) and identify new deregulated species in neurodegenerative diseases. The role of the student will focus on the application of the tools for the quantification and detection of these species, and the subsequent downstream analysis through statistical learning methods to identify signature patterns that discriminate disease conditions versus controls.

References:

Sørensen SS1, Nygaard AB2, Christensen T. miRNA expression profiles in cerebrospinal fluid and blood of patients with Alzheimer's disease and other types of dementia - an exploratory study. Transl Neurodegener. (2016); 5:6 Max KEA, Bertram K, Akat KM, Bogardus KA, Li J, Morozov P, Ben-Dov IZ, Li X, Weiss ZR, Azizian A, Sopeyin A, Diacovo TG, Adamidi C, Williams Z, Tuschl T. Human plasma and serum extracellular small RNA reference profiles and their clinical utility. Proc Natl Acad Sci U S A. (2018); 115(23):E5334-E5343. Gámez-Valero A, Campdelacreu J, Vilas D, Ispierto L, Reñé R, Álvarez R, Armengol MP, Borràs FE, Beyer K. Exploratory study on microRNA profiles from plasma-derived extracellular vesicles in Alzheimer's disease and dementia with Lewy bodies. Transl Neurodegener. 2019 Oct 3;8:31. doi: 10.1186/s40035-019-0169-5. eCollection 2019. Pantano L, Estivill X, Martí E. SeqBuster, a bioinformatic tool for the processing and analysis of small RNAs datasets, reveals ubiquitous miRNA modifications in human embryonic cells. Nucleic Acids Res. (2010); 38(5):e34 Pantano L, Estivill X, Martí E. A non-biased framework for the annotation and classification of the non-miRNA small RNA transcriptome. Bioinformatics (2011); 27(22):3202-3 Rozowsky J, Kitchen RR, Park JJ, Galeev TR, Diao J, Warrell J, Thistlethwaite W, Subramanian SL, Milosavljevic A, Gerstein M. exceRpt: A Comprehensive Analytic Platform for Extracellular RNA Profiling. Cell Syst. 2019 Apr 24;8(4):352-357.e3.

Expected skills::

basic bash programming and R programming language knowledge

Possibility of funding::

No

Possible continuity with PhD: :

To be discussed