From brain organoids to Alzheimer's disease: a systems biology approach of retinoid-driven gene regulatory programs

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Temporally and spatially organized cell fate transitions are at the basis of the genesis of multicellular organisms, and alterations from this body plan can generate pathologies. One such process is **neurogenesis, a highly complex process implicating a variety of regulatory signals, which in a multicellular organization context** (about 100 billion neurons interconnected by several trillion of interconnections) **gives rise to one of the most complex organs retrieved in higher organisms: the brain.** Importantly, while major processes underlying mammalian brain development were previously characterized in rodent model systems, their conservation in humans as well as the characterization of further specific processes, explaining human brain complexity, remains still elusive. This last aspect becomes even more relevant for the development of therapeutic solutions dedicated to mental-related illnesses, like Alzheimer's disease (AD). The recent advances in induced-pluripotent stem (iPS) cell technology and in 3-dimensional human cerebral organoid culture- able to reconstitute brain structures in vitro - provide promising new avenues for studying neurodegenerative diseases.

In this context, **our laboratory aims at combining brain organoid culture strategies with the acquisition of modern functional genomic readouts for extracting molecular characteristics defining basic principles that govern human brain development, but also scrutinize their deregulation under aberrant settings associated for instance to neurodegenerative diseases like AD.**

PhD students' profile and skills required:

Our team would be interested in hosting PhD students with interests/skills in one of these two fields:

**Functional Genomics:** The student should have a Master2 or equivalent with strong knowledge in molecular biology. Background in neurobiology and/or functional genomics is an asset. Furthermore, basis/interest in bioinformatics (NGS) is an asset.

**Bioinformatics:** The student should have a Master2 or equivalent in informatics/bioinformatics/Mathematics or related. Programming skills in Java, Python and/or R are required. Background/interest in functional genomics (NGS), Systems Biology (Gene regulatory networks) as well as in neurobiology is an asset.

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