Despoina Charou (ESR12)

In vitro and in vivo effects of new synthetic and natural compounds on neural stem cells and adult neurogenesis in Alzheimer's Disease

Profile

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My Research

Neurotrophins are growth factors that promote neuronal survival and neurogenesis, while abnormal expression of neurotrophins and their receptors has been associated with neurodegeneration. While these molecules have been shown to slow or prevent neurodegenerative symptoms, limitations like reduced bioavailability, poor ability to penetrate the blood-brain-barrier and short half-life do not allow their therapeutic use. Recent studies have demonstrated that small molecule mimetics that have similar effects and efficacy to neurotrophins, are not constrained by the same limitations, making them better therapeutic candidates.

The overall goal of this project is to test synthetic and natural neurotrophin mimetics on specific neurotrophin-dependent, mainly TrkB expressing, cellular populations and assess the molecular mechanisms and functions leading to increased neuronal survival, synaptogenesis and adult neurogenesis affected in AD. The main focus is be put on the neurorestorative and neurogenic effect of the new compounds, a role that up to now is highly associated with the endogenous neurotrophin, BDNF.

Scientific CV

- 2018- current: Euroneurotrophin Early Stage Researcher, PhD student
  Institute of Molecular Biology and Biotechnology (IMBB), Foundation for Research and Technology Hellas (FORTH) & Department of Pharmacology, Medical School, University of Crete
- 2015-2018: Research Assistant, University of Oxford (Clinical Neurosciences)
- 2013-2014: MSc by Research in Biomedical Sciences, University of Edinburgh
- 2007-2013: Biology D., National and Kapodistrian University of Athens

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EuroNeurotrophin

A European training network for the discovery of neurotrophins small molecule mimetics as candidate therapeutic agents for neurodegeneration and neuroinflammation

Project Coordinator

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Project Partners

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Introduction

Neurodegenerative diseases like Alzheimer's disease or Parkinson's disease are on the rise in developed societies worldwide affecting millions of people. Neurodegenerative diseases primarily affect neurons in the human brain and currently there exists no cure for any of them since most of the available drugs fail to tackle the pathogenesis of neurodegenerative diseases.

Preclinical studies point to the therapeutic potential of neurotrophins, which have been shown to control a number of aspects of survival, development and function of neurons. However, the poor pharmacokinetic properties of neurotrophins render their use as drugs prohibitive.

Objectives

EuroNeurotrophin will address the major limitations of neurotrophins by developing novel small molecule, neurotrophin mimetics with favourable profiles of stability, tissue penetration and targeted biological actions. In the long term, the project will contribute to the further development of small molecule therapeutics for the treatment of neurodegenerative diseases and neuroinflammation, revealing new concepts of neurotrophin receptors signalling and to create a pan-European Neurotrophin Network.

Furthermore, EuroNeurotrophin aims at creating a new generation of young scientists with a broad understanding and skill set in chemical biology with emphasis on the neuroscience field and to educate 14 young researchers regarding the knowledge underpinning the neurotrophin related field as well as on drug and natural products research for neurodegenerative diseases.

Impact

Neurotrophins offer one of the most compelling opportunities to significantly improve the treatment of serious age-related, neurological diseases such as Alzheimer's, Parkinson's, MND/ALS. A major therapeutic advantage of neurotrophic factors is that they tackle both the symptoms of a disease (improving clinical status) as well as its pathogenesis (delaying disease progression) without any prerequisite deep insight into the aetiology or specific pathogenic variables driving the disease process.

We will study neurotrophin small molecule mimetics (synthetic or natural) in depth, and will use them as molecular probes to interrogate the role of neurotrophins and their receptors. It will contribute important new knowledge to the next frontier in biomedical sciences.

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