NEoC – NeuroEnergetics-on-Chip: Disease modeling of impaired brain glucose metabolism using human iPSC-derived neurovascular units (NVU)-on-chip systems

Fact Sheet

Project Information

NEoC
Grant agreement ID: 101109010

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10.3030/101109010

Funded under
Marie Skłodowska-Curie Actions (MSCA)

Total cost
€ 0,00

EU contribution
€ 206 887,68

Coordinated by
KAROLINSKA INSTITUTET
Sweden

Start date
1 August 2023
End date
31 July 2025

Objective

Neurological conditions conquer the world; they are the leading cause of disability and second leading cause of death worldwide. Although there is growing evidence for the immense impact of disturbances in neurometabolism for overall brain function, only little is known about the underlying mechanisms (knowledge gap). Especially human insights are sparse due to a paucity of physiologically relevant model systems (research gap).

To address these challenges, within the scope of the NeuroEnergetics-on-Chip
(NEoC) project, I am proposing the development of a novel, human iPSC-based organ-on-chip model of the neurovascular unit (NVU) that integrates all neurometabolically active NVU cell types and specifically enables the inspection of neurometabolic coupling mechanisms. To categorically cast light onto the mechanisms behind impaired metabolism of glucose, the brain’s principal energy supplier, I will build an NVU-on-Chip disease model of glucose transporter 1 deficiency syndrome (GLUT1-DS). Since GLUT1-DS is monogenic, it presents an excellent paradigm to study cellular and molecular consequences of disturbed neuroenergetics, even beyond the disease itself.

For implementation of the NEoC project, I will i) generate all neurometabolically relevant NVU cell types (endothelial cells, perivascular cells, astrocytes, microglia and neurons) from human iPSC lines derived from GLUT1-DS patients, ii) develop a novel NVU microfluidic platform addressing the shortcomings of existing NVU-on-Chip systems, and iii) build GLUT1-DS-NVU-on-Chip models to specifically study perturbations in energy metabolism, blood-brain barrier integrity and neuroinflammation as a consequence of GLUT1-DS in vitro.

The NEoC project will provide novel knowledge on the underlying mechanisms and pathophysiology of GLUT1-DS, and thereby not only benefit those afflicted by the orphan disease but impact our understanding of a variety of other CNS and metabolically linked disorders.

Fields of science

medical and health sciences › basic medicine › physiology › pathophysiology
engineering and technology › other engineering and technologies › microtechnology › organ on a chip

Keywords

organ-on-chip microfluidics neurovascular unit neuroenergetics iPSCs
GLUT1 deficiency

Programme(s)

HORIZON.1.2 - Marie Skłodowska-Curie Actions (MSCA) MAIN PROGRAMME

Topic(s)
Call for proposal

HORIZON-MSCA-2022-PF-01

See other projects for this call

Funding Scheme

HORIZON-TMA-MSCA-PF-EF - HORIZON TMA MSCA Postdoctoral Fellowships - European Fellowships

Coordinator

KAROLINSKA INSTITUTET

Net EU contribution
€ 206 887,68

Address

Nobels vag 5
17177 Stockholm
Sweden

Region
Östra Sverige > Stockholm > Stockholms län

Activity type
Higher or Secondary Education Establishments

Links

Contact the organisation
Website
Participation in EU R&I programmes
HORIZON collaboration network

Other funding
€ 0,00

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