Patient-specific stem cell-derived models for Alzheimer’s disease and related neurodegenerative disorders

https://www.neurodegenerationresearch.eu/survey/patient-specific-stem-cell-derived-models-for-alzheimer%c2%92s-disease-and-related-neurodegenerative-disorders/

Name of Fellow
Institution
Funder

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Contact information of fellow
Country

EC

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Patient-specific stem cell-derived models for Alzheimer’s disease and related neurodegenerative disorders

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The project/programme is most relevant to:

Alzheimer's disease & other dementias

Keywords

Alzheimer's disease | stem cells | in vitro models | cell reprogramming | non-coding RNA

Research Abstract
Future treatment of incurable neurodegenerative disorders, including Alzheimer’s disease (AD),

frontotemporal dementia (FTD), spinocerebellar ataxia (SCA), and Huntington’s disease (HD), has to be tailored to individual patients or cohorts of patients to obtain an optimal effect. The STEMMAD project is aimed to create a highly innovative international collaboration between 2 R&D intensive SME and 3 distinguished academic partners, including one ICPC Third Country partner. The program will enhance the competitiveness of the SME partners and will have a great impetus in an area of immense societal importance: Neurodegenerative diseases and their potential cure. It is our overall aim, by advanced molecular tools, to derive patient-specific in vitro neural cell models that will allow for such customized treatment. Skin biopsies and blood samples will be collected from genetically and clinically well-characterized patients. Fibroblasts and mononuclear blood cells will be isolated and reprogrammed into induced pluripotent stem cells (iPSCs), which, in turn, will be differentiated into neural progenitor cells (NPCs) and specific neurons. We expect that these neurons will express molecular characteristics of the patient’s “disease phenotype” and thereby be representative as patient-specific neural cell models. The models will be characterized for functional disease parameters, used for studies of molecular pathogenesis. The iPSC reprogramming and neural differentiation will be controlled by advanced molecular technologies including manipulation of microRNA (miRNA) expression as well as the use of plasmid minicircles with reprogramming factor genes, thus leaving the genome free of transgenes. To ensure the success of the project, direct transdifferentiation of fibroblasts into neurons, without an intermediate “stem cell” stage, will also be attempted as an alternative strategy for generating patient-specific neural cell models.

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