Frontier research in arterial fibre remodelling for vascular disease diagnosis and tissue engineering

Fact Sheet

Project Information

FibreRemodel

Grant agreement ID: 637674

Project website

Status

Ongoing project

Funded under

H2020-EU.1.1.

Overall budget

€ 1 521 875

EU contribution

€ 1 521 875

Start date

1 September 2015

End date

31 August 2021

Hosted by

THE PROVOST, FELLOWS, FOUNDATION SCHOLARS & THE OTHER MEMBERS OF BOARD OF THE COLLEGE OF THE HOLY & UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN

Ireland

Objective

Each year cardiovascular diseases such as atherosclerosis and aneurysms cause 48% of all deaths in Europe. Arteries may be regarded as fibre-reinforced materials, with the stiffer collagen fibres present in the arterial wall bearing most of the load during pressurisation. Degenerative vascular diseases such as atherosclerosis and aneurysms alter the macroscopic mechanical properties of arterial tissue and therefore change the arterial wall composition and the quality and orientation of the underlying fibrous architecture. Information on the complex fibre architecture of arterial tissues is therefore at the core of understanding the aetiology of vascular
arterial tissues is therefore at the core of understanding the aetiology of vascular
diseases. The current proposal aims to use a combination of in vivo Diffusion Tensor
Magnetic Resonance Imaging, with parallel in silico modelling, to non-invasively
identify differences in the fibre architecture of human carotid arteries which can be
directly linked with carotid artery disease and hence used to diagnose vulnerable
plaque rupture risk.
Knowledge of arterial fibre patterns, and how these fibres alter in response to their
mechanical environment, also provides a means of understanding remodelling of
tissue engineered vessels. Therefore, in the second phase of this project, this novel
imaging framework will be used to determine fibre patterns of decellularised arterial
constructs in vitro with a view to directing mesenchymal stem cell growth and
differentiation and creating a biologically and mechanically compatible tissue
engineered vessel. In silico mechanobiological models will also be used to help
identify the optimum loading environment for the vessels to encourage cell
repopulation but prevent excessive intimal hyperplasia.
This combination of novel in vivo, in vitro and in silico work has the potential to
revolutionise approaches to early diagnosis of vascular diseases and vascular tissue
engineering strategies.

Field of science
/medical and health sciences/medical biotechnology/cells technologies/stem cells
/medical and health sciences/medical biotechnology/tissue engineering
/medical and health sciences/clinical medicine/angiology/vascular diseases
/medical and health sciences/clinical medicine/radiology/medical imaging/magnetic resonance imaging
/medical and health sciences/clinical medicine/cardiology/cardiovascular diseases
/medical and health sciences/clinical medicine/cardiology/cardiovascular diseases/arteriosclerosis

Programme(s)

Topic(s)

Call for proposal
ERC-2014-STG

Funding Scheme
ERC-STG - Starting Grant

Host institution
THE PROVOST, FELLOWS, FOUNDATION SCHOLARS & THE OTHER MEMBERS OF BOARD OF THE COLLEGE OF THE HOLY & UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN

Address
College Green
2 Dublin
Ireland

Activity type
Higher or Secondary Education Establishments

EU contribution
€ 1 521 875

Website
Contact the organisation

Beneficiaries (1)

THE PROVOST, FELLOWS, FOUNDATION SCHOLARS & THE OTHER MEMBERS OF BOARD OF THE COLLEGE OF THE HOLY & UNDIVIDED TRINITY OF QUEEN ELIZABETH NEAR DUBLIN

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