Massive parallel de novo design of sensing nanopores

Fact Sheet

Project Information

PoreMADNeSS

Grant agreement ID: 101117269

DOI
10.3030/101117269

EC signature date
18 October 2023

Start date
1 April 2024

End date
31 March 2029

Funded under
European Research Council (ERC)

Total cost
€ 1 831 287,50

EU contribution
€ 1 499 250,00

Investment in EU policy priorities

Digital agenda	○	Clean air	○
Artificial Intelligence	○	Climate action	○
Biodiversity	○		

Coordinated by
VIB VZW
Belgium

Objective

Proteins embedded in membranes play key roles in maintaining cell integrity, homeostasis and communication. Emerging technologies (nanopore sequencing, synthetic cells, ...) imitate biological systems and repurpose membrane protein for the transport and sensing of new analytes through synthetic membranes. These applications have fuelled the demand for (synthetic) membrane proteins with

properties and functions not observed in nature. Structure-based computational protein design is revolutionizing many aspects of biotechnology but has almost exclusively focused on protein folding in water. The aim of PoreMADNeSS is to develop innovative strategies to enable the design of transmembrane β-barrels (TMBs), a class of membrane proteins with excellent properties to act as nanopore sensors. Using multidisciplinary approaches, we will address basic biophysical knowledge gaps that currently limit TMB design. The design of TMB folding in synthetic membranes gives access to a wealth of TMB sequences and structures not sampled by nature because of constraints associated with biogenesis and with the composition of biomembranes. We propose a combination of massive parallel de novo design and adaptive machine learning to explore this unknown TMB space, to gain crucial insight into the determinants of TMB folding and to develop robust design methods. As a proof-of-concept, PoreMADNeSS will focus on the design of steroid sensing nanopores. Our strategy is to design a cortisol binding site across the transmembrane channel, which would act as the reading head for single molecule fingerprinting. My lab was first to demonstrate the feasibility of TMB design and has established a design pipeline from computation to electrophysiology and biochemical characterization. This project has all the components to translate into transformative advances in nanopore sensing and sequencing by providing the nanopore R&D community with accurate and innovational computational design methodologies.

Fields of science (EuroSciVoc)

natural sciences > biological sciences > biochemistry > biomolecules > **proteins**

medical and health sciences > basic medicine > physiology > **homeostasis**

Programme(s)

HORIZON.1.1 - European Research Council (ERC) MAIN PROGRAMME

Topic(s)

ERC-2023-STG - ERC STARTING GRANTS

Call for proposal

ERC-2023-STG

See other projects for this call

Funding Scheme

HORIZON-ERC - HORIZON ERC Grants

Host institution

VIB VZW

Net EU contribution

€ 1 499 250,00

Total cost

€ 1 831 287,50

Address

SUZANNE TASSIERSTRAAT 1
9052 ZWIJNAARDE - GENT
Belgium

Region

Vlaams Gewest > Prov. Oost-Vlaanderen > Arr. Gent

Activity type

Research Organisations

Links

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

Beneficiaries (1)

VIB VZW

Belgium

Net EU contribution

€ 1 499 250,00

Address

SUZANNE TASSIERSTRAAT 1
9052 ZWIJNAARDE - GENT

Region

Vlaams Gewest > Prov. Oost-Vlaanderen > Arr. Gent

Activity type

Research Organisations

Links

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

Total cost

€ 1 831 287,50

Last update: 3 November 2023

Permalink: https://cordis.europa.eu/project/id/101117269