future neuro

Delivering transformative diagnostics, treatments and digital healthcare solutions for neurological, neurodevelopmental and neuropsychiatric conditions

FutureNeuro invites partnerships with industry, clinical and academic collaborators to address mutually-identified scientific challenges which lead to earlier disease detection, more precise treatment, and patient-empowered care pathways.

- The epilepsies
- ALS/MND
- Parkinson's Disease
- Multiple Sclerosis
- TBI
- Autism
- Psychosis
- Mental Health

A World Leading Research Ireland Centre

Taighde Éireann
Research Ireland

FutureNeuro Research Ireland Centre for Translational Brain Science

FutureNeuro is a Research Ireland Centre and collaborates internationally with industry, academic and clinical networks. Our unique multi-disciplinary preclinical and clinical research addresses the major challenges in improving how we diagnose neurological disorders, the implementation of genomics for diagnosis and precision therapy, the development of the next generation of precision and disease-modifying treatments, and the rapid progress of data science that can glean powerful insights from clinical datasets.

Hosted by RCSI University of Medicine and Health Sciences, our research network combines integrated expertise in neuroscience and neurological, neurodevelopmental and neuropsychiatric disease from eight leading Irish universities and a national research-active clinical network.

Building on our strong focus on epilepsy and amyotrophic lateral sclerosis (ALS), we leverage cross-disease and multidisciplinary expertise to deliver advances into other neurological (e.g. Parkinson's, MS), psychiatric (e.g., psychosis) and neurodevelopmental disorders (e.g. autism) and the serious co-morbid aspects of these diseases.

Prof David Henshall

Director

Non-coding RNAs, preclinical pharmacology, epilepsy

Prof Gianpiero Cavalleri

Deputy Director

Genomic diagnostics, NGS analysis, genetic burden

Prof Jochen Prehn

Molecular neurodegeneration, systems modelling, spatial tissue profiling

Prof Norman Delanty

Clinical epileptology, patient registries, bio-banking

Prof Mary Cannon

Psychiatric epidemiology, digital health therapeutics

Prof David Cotter

Psychiatry, bio-markers, prediction

Prof Kathleen Bennett

Biostatistics, epidemiology, data science, population health

Prof Robert Forster

Bio-medical diagnostics

Prof Sanbing Shen

Stem cells, drug discovery

Prof Lorna Lopez

Genomics, psychiatric genetics, circadian health

Prof Orla Hardiman

Epidemiology, genetics, deep phenotyping ALS/ MND, clinical trials

Prof Matthew Campbell

Gene therapy, large molecules across blood brain barrier, TBI

Prof Colin Doherty

Clinical epileptology, digital health

- Royal College of Surgeons in Ireland
- Trinity College Dublin
- Dublin City University
- University of Galway
- National University of Ireland Maynooth

Our Investigator Team Drives World-leading Scientific Discovery

Our team comprises of internationally acclaimed research talent in neuroscience, clinical neurology, psychiatry, genetics, pharmacology, gene therapy, cell biology, materials chemistry and patient data analytics. Our scientists and clinicians engage with patients, healthcare providers, industry partners and policy makers to reduce the individual, societal and economic burden of neurological diseases. Our principal researchers are key opinion leaders (KOLs) in neurological research - they lead international research collaborations, have secured research funding in excess of €80m and hold a portfolio of patents in diagnostics and therapeutics.

Dr Rob Argent Connected health, digital health systems, digital health devices, wearables, user experience

Dr Malika Bendechache

Big data analytics, machine learning, artificial intelligence (AI), data governance, data value and risk

Dr Gary Brennan

Epigenetics, RNA processing in epilepsy

Dr Susan Byrne

Paediatric neurogenomics, research registries, clinical translation

Dr Niamh Connolly

Bioinformatics, precision medicine

Dr Daniel Costello

Epidemiology, genetics, early natural history of epilepsy

Prof Mark Cunningham

Electrophysiology, human tissue, tumour related epilepsy

Prof Annie Curtis

Circadian immunometabolism

Dr Michael-John Dolan

Single-cell and spatial genomics, bioinformatics

Dr Jennifer Dowling

Neuroinflammation, immunity, inflammation

Prof Tobias Engel

Epilepsy, translational, purinergic signalling, ATP

Prof David Finn

Neuropharmacology, pain, endocannabinoid system

Prof Claire Gillan

Computational psychiatry, digital health

Prof Rory Johnson

Non-coding RNAs, RNA therapeutics, genomics

Dr Hugh Kearney

Clinical Multiple Sclerosis

Dr Deirdre Kilbane

Nanotechnology, AI, molecular, quantum communication

Dr Omar Mamad

Electrophysiological recording, optogenetics

Dr Russell McLoughlin

Population genomics, complex traits, ALS

Prof Catherine Mooney

ML, computational biology, bioinformatics, health informatics

Dr Bahman Nasseroleslami

Neuro-electric signals, data analytics, neurophysiological biomarkers, MND

Dr Cristina Ruedell Reschke

Mechanisms of epilepsy, circadian rhythms, therapeutic development

Prof Daniela Tropea

Neuordevelopmental disorders, insulin-like growth factor 1, Rett Syndrome

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Our Vision

Empowering people impacted by neurological and neuropsychiatric conditions.

Our Mission

Patient- and clinician-informed research that delivers transformative diagnostics, treatments and digital healthcare solutions.

Our Values

Scientific innovation, rigour, integrity, equality and diversity, delivered in close collaboration with patients and the public.

HOST INSTITUTION

RCSI UNIVERSITY OF MEDICINE AND HEALTH SCIENCES

PARTNER INSTITUTIONS

DCU · Maynooth University · SETU · Trinity College Dublin · UCC · University College Dublin · Ollscoil na Gaillimhe University of Galway

FUNDED BY

Taighde Éireann Research Ireland

Clinical Network

FutureNeuro-affiliated clinical neurologists and psychiatrists, spanning the main adult and paediatric hospitals across Ireland, represent the advanced clinical care of patients with neurological, neurodevelopmental and psychiatric diseases. This gives us access to well-defined and stratified patient cohorts for clinical trials. Our patient registers provide granular data to inform diagnostic and therapeutic interventions and our biosample collection and curation programme facilitates genetic diagnosis, precision therapeutics and gene discovery. Our clinician scientists inform the potential translation of research from laboratory to clinic to living room. Ultimately, this national clinical and patient network supports our researchers to develop personalised medicine and individualised care for people living with brain conditions.

Integrated Academic and Clinical Research Network

Our Research Goals

DIAGNOSTICS

- Use genomic and RNA sequencing to aid in stratification of patients.
- Develop tools to optimise genomic diagnostics and increase diagnostic yield.
- Progress circulating biomarkers towards clinical use and identify novel molecular species to better predict disease trajectory and co-morbidities.
- Identify and develop non-circulating 'dry' biomarkers, via advanced neurophysiological signal processing, retinal imaging and spectral EEG.
- Develop multianalyte, ultrasensitive sensor technology for point-of-care biomarker testing.

THERAPEUTICS

- Identify novel disease-modifying and precision therapies including noncoding RNAs, components of the blood-brain barrier and the molecular signals driving inflammation.
- Advance therapies to translation, moving new targets through proof-of-concept in vivo testing toward preclinical development, and lay the foundations for continued drug target discovery.
- Use our human models to screen and validate targets.
- Apply our advanced multi-omics and electrophysiology technologies to deepen knowledge of the mechanism of action, and optimise delivery, safety and companion biomarkers.

DIGITAL HEALTH

- Expand the co-creation of electronic health records based on best-in-class data governance practices.
- Progress a learning health system with interoperability supports that facilitate the harmonisation, aggregation and integration of siloed data sources.
- Harness the power of big data and AI to yield new knowledge from clinical data to improve patient outcomes.
- Develop digital therapeutic interventions to improve the precision of identifying patients at risk and guiding future delivery of care.

Examples of FutureNeuro-led and Enabled Breakthroughs

1. Single-cell sequencing reveals new insights into epilepsy mechanisms

High-resolution single-cell and spatial 'omics analyses identify key transcriptional changes in drug-resistant epilepsy and rare neurodevelopmental disorders. JCI Insight (2025). https://insight.jci.org/articles/view/184518

2. Targeting the P2X7 receptor for seizure control

Gene therapy using adeno-associated viral vectors to modulate the P2X7 receptor in inhibitory neurons reduces seizure susceptibility in Dravet syndrome models. Brain, Behavior and Immunity (2024). https://www.sciencedirect.com/science/article/pii/S0889159124004136?via%3Dihub

3. Blood-brain barrier dysfunction linked to Long COVID brain fog

Brain imaging and cellular assays reveal persistent blood-brain barrier disruption in Long COVID patients with cognitive impairment. Nature Neuroscience (2024). https://www.nature.com/articles/s41593-024-01576-9

4. AI-driven EEG analysis improves epilepsy and ALS diagnosis

Machine learning models achieve 99% accuracy in pediatric seizure detection and reveal novel EEG biomarkers for cognitive impairment in ALS. Brain Topography (2024). https://link.springer.com/article/10.1007/s10548-024-01078-8

5. Next-generation biosensors for ultra-sensitive biomarker detection

Advanced nanomaterials enable the rapid and precise detection of brain disease biomarkers in blood, opening new avenues for early diagnosis. Analytical Chemistry (2024). https://pubs.acs.org/doi/10.1021/acs.analchem.4c04454

6. Harnessing real-world data to improve epilepsy treatment

Analysis of 10,000+ patient records from the National Epilepsy Electronic Patient Record (EPR) provides critical insights into medication response and seizure outcomes. Epilepsy Research (2024). https://www.sciencedirect.com/science/article/abs/pii/S0920121124000779?via%3Dihub

Infrastructures and Technology Platforms

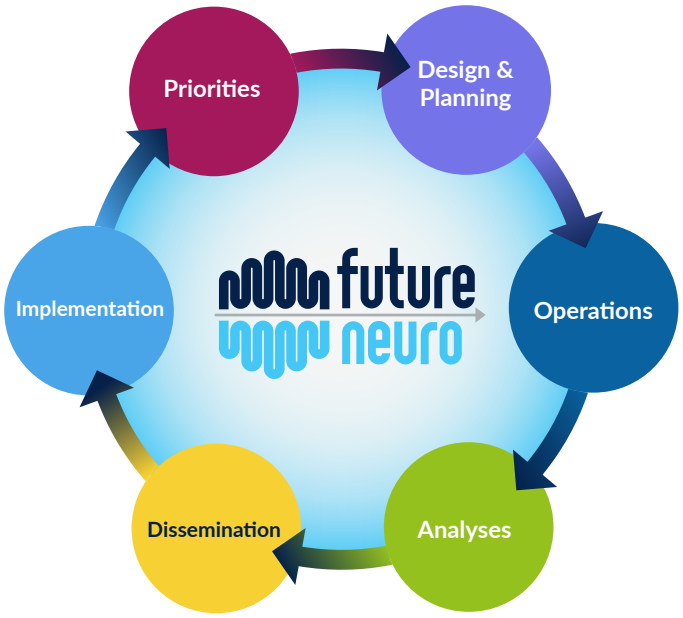
Across our national academic and clinical network, we have access to state-of-the-art research infrastructure and competencies. Our ability to combine and apply these technologies across our themes of Diagnosis, Therapeutics and Digital Health makes us distinctive and excellent and provides a one-stop-shop for translational partnerships.

Technology Platform I (Genomics, bioinformatics and computational biology)

- Next-generation bulk sequencing platforms, DNA, WGS, exome, RNA and epigenetics
- Proteomics core (Mass spectrometry)
- Bioinformatics and systems biology core
- High Performance Compute and storage facilities for datasets

Technology Platform II (Preclinical modelling and disease phenotyping)

- Mouse models: (Induced and genetic epilepsy models, schizophrenia, Dravet, CDKL5, Rett, TBI, ALS, psychosis)
- Comprehensive pre-clinical in vivo phenotyping
- Human models (iPSC generation, acute and organotypic human brain slice)
- Electrophysiology (in vivo, patch and extracellular)
- Molecular, cellular and brain imaging
- Supporting cores in AAV vector production, bioinformatics, transgenic mice
- Capabilities for engineering transgenic mice models for target of interest



Patient involvement across the research cycle

Technology Platform III (Companion Diagnostics)

- High-speed electrochemistry
- Sensor system development
- Human neurophysiology and brain function (fMRI, DCE-MRI, high-density EEG)
- Transcranial magnetic stimulation

Technology Platform IV (Digital Health)

- Large-scale longitudinal electronic patient records for epilepsy and ALS
- Adult (EAGER) and paediatric (CINDI) epilepsy registers for gene-related clinical trials
- Multi-modal platform to enable clinical trials for ALS (Precision-ALS)
- Expanding patient registry in Multiple Sclerosis
- Health data analytics using AI/ML
- Neureka Smartphone App in Brain Citizen Science (>25,000 active users)
- Patient portal infrastructure

Technology Platform V (Clinical trials infrastructure)

- Clinical Research Centres at Beaumont, St James', Cork University hospitals and Children's Health Ireland
- Electronic trials infrastructure: Precision ALS data infrastructures in development, integration of multi-modal data sets
- Support for ethics and health regulatory application process
- In-patient epilepsy monitoring units, integration and evaluation of wearable technologies
- Biobanking: DNA, CSF, plasma/serum, fibroblasts

Patient Informed Research

FutureNeuro prioritises Public Patient Involvement (PPI) in our research. Collaborating with 13 PPI panels, our researchers engage in dynamic, reciprocal partnerships with people living with, or caring for, people with neurological and neuropsychiatric conditions, with their advocates and with the clinicians who provide medical care.

Partnering with FutureNeuro

Industry Collaborations

Our multi-disciplinary research team has a track-record in building enduring relationships with national and international companies to deliver collaborative projects, which address key clinical challenges and progress mutual research objectives which will lead to earlier detection, more precise treatment, and patient-empowered care pathways.

We welcome collaborative projects with industry covering:

- Discovery and interpretation of genomic data to aid patient stratification
- Discovery and validation of new drug targets
- Tools to enable greater diagnostic yield in clinical genomic testing
- Development of rapid multi-analyte point of care tools for diagnosis
- Epigenetics and pharmacogenomics
- Discovery and translation of circulating biomarkers
- Discovery of data-driven 'dry' biomarkers
- Preclinical testing of oligonucleotide, gene therapy and small molecule therapies
- Socio-technical factors to enable a data driven health ecosystem
- Application of AI and machine learning to large clinical data-sets
- Connected Health and digital therapeutics
- Early-stage clinical trials
- Leverage our portfolio of potential therapeutic targets, advancing them through validation stages and preclinical proof of concept

Partnering opportunities include fully- or co-funded research collaborations and joint applications for large-scale funding (e.g., Horizon Europe, NIH). With a strong track record and dedicated grant-writing support, we offer expertise in industry engagement, technology transfer, IP management, and commercialisation. Our funding model provides access to favourable co-funding options, and we work closely with State Agencies to secure appropriate funding mechanisms for partners, leveraging national programmes, for example, Enterprise Ireland Innovation Partnership or Disruptive Technology Innovation Fund.

Examples of current partners:

Roche, ucb, Novartis, Johnson&Johnson Innovative Medicine, IQVIA, Angelini Industries, UNEEG medical, NEUmiRNA Therapeutics

Academic Collaborations

FutureNeuro researchers collaborate with world-leading scientists and clinician scientists to advance discovery into neurological, neurodevelopmental and neuropsychiatric conditions.

Examples for our EU-funded projects include:

- **PRIME:** This project funded under the EU Future and Emerging Technologies (FET) Open programme brings together academic and industry partners from 5 countries to build 'living brain implants' that detect seizures before they occur, and trigger the pre-emptive release of therapeutic molecules.
- **Genome of Europe:** This is an ambitious pan-European project implemented jointly by 51 institutes across 27 European countries. It aims to build a European reference genome that will help unlock new advances in medicine and benefit public health policy.
- **NeuroAdapt:** This MSCA supported COFUND bringing 11 postdoctoral researchers from around the world to Ireland, equipping them with the specialised skills needed to advance research into neurological conditions such as epilepsy, Parkinson's disease, multiple sclerosis and motor neuron disease, along with neurodevelopmental and psychiatric conditions.
- **AI in Parkinson's Disease (AIPD):** This Marie Skłodowska-Curie funded initiative training 14 Doctoral Candidates in an intersectoral, international, and interdisciplinary environment, focusing on the intersection of AI and biomedicine. With a strong translational approach bridging academia and industry, AIPD offers opportunities for networking, skills development, and career advancement. Research areas include precision medicine, digital health, and trustworthy AI, all applied to Parkinson's Disease.

Since its launch in 2017, FutureNeuro has supported multiple successful Marie Skłodowska-Curie Action (MSCA) Postdoctoral Fellowship applications, attracting excellent researchers with a passion for neuroscience to Ireland. We welcome contact from potential candidates and can provide dedicated grant writing support. Opportunities also exist for collaboration with industry organisations through secondments and non-academic placements.

To discuss a research partnership with FutureNeuro, please contact:
Bridget Doyle Centre Manager
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To discuss an academic collaboration, please contact:
Aisling Loftus – International Funding Officer
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Diagnostics

Therapeutics

Digital Health

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Ollscoil na Gaillimhe University of Galway
UCD Dublin
UCC University College Cork, Ireland Coláiste na hOllscoile Corcaigh
Maynooth University National University of Ireland Maynooth
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