Neuropharmacology

Neuropharmacology is a discipline that links neuroscience to the pharmacological treatment of psychiatric and neurological disorders.

Research facilities are based in the School of Pharmacy & Pharmaceutical Sciences and Trinity College Institute of Neuroscience (TCIN)

**Director of Neuropsychopharmacology Research Group**
Andrew Harkin
Associate Professor of Pharmacology

**Contact details:** Trinity College Institute of Neuroscience and School of Pharmacy and Pharmaceutical Studies, Trinity College Dublin

edmail: aharkin@tcd.ie
Telephone: 353-01-896-8575 or 896-2807

**PhD Opportunities:**
Information regarding funding opportunities to undertake a PhD in the group may be obtained in the following link.

See [www.pharmacy.tcd.ie/postgraduate/funding.php](http://www.pharmacy.tcd.ie/postgraduate/funding.php)

For further website information see:

[www.pharmacy.tcd.ie](http://www.pharmacy.tcd.ie)
[www.neuroscience.tcd.ie](http://www.neuroscience.tcd.ie)

Selected examples of projects are outlined below:

**Brain Imaging Return to Health**

Marie Curie Initial Training Networks (ITN): FP7-PEOPLE-2012-ITN Brain Imaging Return to Health “reBIRTH” (see [http://www.rbirth.eu/](http://www.rbirth.eu/)) The r'BIRTH consortium is a Marie Curie Initial Training Network that gathers experts on molecular mechanisms of age-associated pathologies including neurodegeneration and depression. They work together to identify stress-regulated molecules provoking neuronal atrophy and hindering neurogenesis, and monitor the consequences of these processes in human brain. At the cellular level, diminished birth of new neurons (neurogenesis) contributes to cognitive decline and increased depressive and anxiety disorders that are associated with ageing. The work is funded by the European Commission (FP7) under the sub-programme PEOPLE (Marie Curie Actions). 16 early stage researchers will be trained in the topics of the programme i.e. molecular imaging (MRI), proteomics, immunotechnology, high content screening, molecular neuroscience, neuropharmacology and patient studies. The training is provided by seven universities, two private companies and one non-profit research organisation from 7 European countries.
Early diagnosis, treatment and prevention of mood disorders targeting the activated inflammatory response system.

A collaborative, large-scale focused research project entitled “Early diagnosis, treatment and prevention of mood disorders targeting the activated inflammatory response system. [Acronym: MOODINFLAME]. A consortium of 14 European Universities/Research Institutes and 4 SMEs have come together for this project with the overall objective of developing biomarker tests for mood disorder patients based on an activated inflammatory response system (IRS) and inflammation-mediated disturbances in tryptophan metabolism. As part of this programme patients are treated with drugs to counteract the consequences of an activated IRS/disturbed metabolism of tryptophan. The project leads to an enhanced understanding of the pathogenesis of inflammation-related mood disorders, and of the mechanism of anti-inflammatory drugs and drugs targeting tryptophan metabolism in treating depressive behaviour.

Neuronal nitric oxide synthase: A novel target for antidepressant activity

Inhibition of N-methyl-D-aspartic acid receptors (NMDA-R) has shown considerable promise as a drug target to produce new antidepressants that work faster, and are more effective than existing antidepressants. However, targeting NMDA-R directly is problematic due to adverse effects. We hypothesise that targeting signalling events down-stream of NMDA-R may provide a more viable approach. nNOS is a down stream target of NMDA-R. We have published a number of original papers demonstrating that 1) NOS inhibitors have antidepressant properties 2) such properties are dependent on endogenous serotonin and 3) NOS inhibitors can augment the effects of conventional antidepressants in preclinical models. Currently our research is assessing the efficacy of nNOS inhibitors as novel antidepressant agents. A future aim is to determine if uncoupling the NMDA-R from nNOS can elicit antidepressant actions. Funded by the Health Research Board

Recreational MDMA (“Ecstasy”) abuse – implications for neuropsychiatric disorders

Our research has demonstrated reduced behavioural and neurochemical responses to the serotonin based antidepressant fluoxetine in tests of antidepressant activity following MDMA-induced serotonin loss in preclinical models. These results have important clinical relevance, suggesting that serotonin reuptake inhibitors may be less effective at treating depression in individuals with a history of MDMA/“Ecstasy” abuse.

Interaction between caffeine and recreational drugs

My research has demonstrated that caffeine profoundly exacerbates the hyperthermia, tachycardia and long-term serotonin loss associated with MDMA administration in an animal model and can induce lethality. More recently we have identified that the neurotransmitter dopamine plays a key role in mediating the ability of caffeine to exacerbate the toxicity of MDMA. Consequently, we aim to determine if the ability of caffeine to augment MDMA-induced toxicity generalizes to other dopaminergic enhancers such as d-amphetamine, cocaine and buproprion. The project will elucidate the mechanism underlying a serious drug interaction, and clarify risks associated with
the concurrent consumption of caffeine with drugs which increase dopaminergic transmission. This work is supported by the Health Research Board.

**Selected Research Publications**


Current Research Projects & Funding

2013-2016: Marie Curie Initial Training Networks (ITN): FP7-PEOPLE-2012-ITN Brain Imaging Return to Health “reBIRTH” (http://www.rbirth.eu/)


Early diagnosis, treatment and prevention of mood disorders targeting the activated inflammatory response system. [Acronym: MOODINFLAME ] 2008-2013. Type of funding: A collaborative, large-scale focused research project FP7- HEALTH-2007-2.2.1-8: From mood disorders to experimental models

The laboratory has also received support from SFI, Enterprise Ireland, Health Research Board & IRCSET

Members of the Research Group
Prof. Andrew Harkin (PI)
Dr. Allison McIntosh (Post-doctoral researcher)
Shane Gormley
Justin Yssel (with Prof. Thomas Connor)
Eimear O’Neill (with Prof. Thomas Connor)
Eoin Sherwin
Eileen O’Toole
Katherine O’Farrell
Elaine Dempsey
Jennifer David
Chloe Farrell (with Prof. Veronica O’Keane)
Kelly Doolin (with Prof. Veronica O’Keane)

Lab Alumni
Dr. Sinead Gibney (Post-doctoral)
Dr. Alessia Piazza (Post-doctoral)
Dr. Ruth McNamara (2005, NUI Galway)
Dr. Natacha Vanattou-Saifoudine (2010, TCD)
Dr. Lorna Gleeson (2010, TCD)
Dr. Jennifer Rouine (2012, TCD)
Dr. Aine Abautret-Daly (2013, TCD)
Dr. Valentina Gigliucci (2013, TCD)
Dr. Marika Doucet (2013, TCD)
Dr. Martina Hughes (2014, TCD with Prof. Thomas Connor)
Dr. Barry McGuinness (2014, TCD with Prof. Thomas Connor)
Dr. Eimear Fagan (2014, TCD with Prof. Thomas Connor)

TCD Collaborators
Dr. Christian Kerskens, Trinity College Institute of Neuroscience
Prof. Arun Bodke, Trinity College Institute of Neuroscience
Prof. Declan McLoughlin, Trinity College Institute of Neuroscience
Prof. Thomas Frodl, Trinity College Institute of Neuroscience
Prof. Veronica O’Keane, Trinity College Institute of Neuroscience
Prof. Carlos Medina, School of Pharmacy & Pharmaceutical Sciences, TCD
Dr. Neil Docherty, Department of Physiology, School of Medicine, TCD

National and International Collaborators
ReBirth EU collaborative network
MOODINFLAME EU collaborative network
Prof. Luigia Trabace and Dr. Marilena Colaianna, University of Foggia, Italy
Dr. Marjan Versnel, Erasmus MC, Rotterdam, The Netherlands
Prof. Maria Moro, Complutense University, Madrid, Spain