Cajal course on
Neuroinflammation and how to study it

Instructors

**Dr Elena Avignone, PhD** (CNRS UMR 5297, University of Bordeaux, France)

**Biosketch:**
Elena Avignone is an associated professor at the University of Bordeaux. She teaches in the international masters of bio-imaging and neuroscience. Her research aims to elucidate the relationship between microglial cells and neurons in physiological and pathological conditions. In the last years she characterized the microglial properties after status epilepticus. She is now working on role of microglial during the development, and how dysfunction of these immune cells affects the pathophysiology of neuropsychiatric disorders.

**Selected references:**

**Dr. Jimena Baleriola, PhD** (University of the Basque Country, Bilbao, Spain)

**Biosketch:**
Dr Jimena Baleriola is a neuroscientist specialized in unraveling basic mechanisms that mediate cell death in neural development and neurodegeneration. During the last years she has been committed to the better understanding of the contribution of intra-axonal signaling events in the pathogenesis of Alzheimer’s disease, with a special focus on mRNA localization and local translation.

She graduated with a B.Sc. in Biochemistry at the Universidad Complutense de Madrid (2003) and started her career as a neuroscientist at Centro de Investigaciones Biológicas (Madrid, 2004). From 2004 to 2010 she conducted research on the molecular alterations that affect DNA integrity and impact on programmed cell death during central nervous system development.

To further her career in neuroscience, in 2010 she joined the Taub Institute for Research on Alzheimer’s Disease and the Aging Brain, Columbia University Medical Center (New York, USA). Her research projects aimed to unravel a possible function for intra-axonal protein synthesis in amyloid pathology, a central feature of Alzheimer’s disease. Throughout these years she gained extensive
expertise, not only in the basic mechanisms that lead to cell death during neural development and neurodegeneration, but more importantly, in mRNA localization and local translation.

Since 2016 she is an Ikerbasque Research Fellow and group leader of the Laboratory of Axon-Glia Interactions at Achucarro Basque Center for Neuroscience. Her lab focuses on deciphering the contribution of glial cells to intra-axonal protein synthesis through horizontal transfer of exosomal RNAs and other bioactive molecules in physiological and pathological conditions.

Selected references:


**Dr. Estibaliz Capetillo, PhD** (University of the Basque Country, Bilbao, Spain)

Biosketch:

Dr Estibaliz Capetillo is a neuroscientist who is committed to the understanding of the pathogenesis of Alzheimer's disease (AD) with the aim of contributing to the development of more effective therapies for this major disease of aging. Her research focuses on the role of microglia, immune cells of the nervous system, on pathological synapses in AD. General working hypothesis focuses in the possible beneficial effects of microglia manipulation on synapse recovery with the goal of improvement of synapse and the aim of finding therapeutic targets for AD.

She graduated in Biology (Neurobiology) at the Complutense University of Madrid, Spain in 2001 and completed her education with a Master in Human Neurobiology at the Sheffield Hallam University, Sheffield, England in 2002. Her starting point of research for AD was the master project. She obtained the PhD at the University of Bonn (Germany) on 2007 at the laboratory of Prof. Thal. She worked as postdoctoral researcher at the laboratory of Prof. Gouras till 2012 and as research associate at the laboratory of Prof. Maxfield till 2014, both laboratories located at Weill Cornell Medical College, New York (USA). Currently she holds an Ikerbasque Research Fellow position at University of the Basque Country UPV/EHU and Achucarro Basque Center for Neuroscience, and an adjunct assistant professor position at Weill Cornell Medical College. During her scientific career she published 23 scientific publications on the field of AD and neurodegenerative diseases. She has also been granted with several awards, highlighting Leda Hanin Award (2011) for an outstanding young researcher in the field of AD.
Selected references:


**Dr. Colm Cunningham, PhD** (Trinity College Dublin, Ireland)

Biosketch:
Dr Colm Cunningham is a Neuroscientist with a specific interest in how systemic inflammation affects brain function. After a Ph.D. in Neurochemistry (1998), with K.F. Tipton in Trinity College Dublin (TCD), Colm pursued post-doctoral research in experimental neuropathology with Prof. Hugh Perry (University of Southampton, UK). His post-doctoral work examined the microglial response to chronic neurodegeneration and together they discovered microglial priming and described the acceleration of neurodegenerative disease by systemic inflammation.

In 2006 and 2010 he was awarded consecutive Wellcome Trust Career Development and Senior Fellowships to establish and develop the first animal models of delirium during dementia and his research group published several influential papers in the areas of neuroinflammation, microglia, delirium and dementia (Biological Psychiatry, Journal of Neuroscience, Neurobiology of Aging, Nature Reviews Immunology, GLIA, Brain, Behavior & Immunity). Dr Cunningham has since taken up a permanent post as Assistant Professor in Neuroscience in TCD. His work for some years has concerned the impact of systemic inflammation on the normal and diseased brain. The interaction between prior neurodegenerative pathology and superimposed secondary insults in delirium and long-term cognitive decline is the major focus of his work, and his laboratory is funded by the US National Institutes of Health (NIH), Alzheimer’s Research UK and the Simons Foundation (NY).

Selected references:

Edel Hennessy, Eadaoin. W. Griffin, **Colm Cunningham** (2015) Astrocytes are primed by chronic neurodegeneration to produce exaggerated chemokine and cell infiltration responses to acute stimulation with the cytokines IL-1β and TNF-α. *Journal of Neuroscience*. Jun 3;35(22):8411-22 (DOI:10.1523/JNEUROSCI.2745-14.2015)


Dr. Xavier Fioramonti, PhD (INRA, Bordeaux, France)

Research area: Role of brain nutrient sensing in the control of glucose homeostasis, food intake and emotional behaviour.

After a PhD of Neurophysiology in Dr Penicaud’s laboratory where I characterized specialized « glucose-sensing » neurons in the hypothalamus of rodents (2002-2005), I joined Pr. Routh’s lab (Rutgers University, Newark, NJ) where I studied the role of hypothalamic nitric oxide (NO) in the regulation and brain detection of iatrogenic hypoglycemia (2006-2010). After this postdoctoral experience, I was recruited as CR INRA (eq. Assistant professor) at the CSGA in Dijon (2010-2016) before joining the NutriNeuro institute since September 2016 where I pursue the study of the role of brain nutrient sensing in the control of glucose homeostasis, food intake and emotional behavior.

Technical skills: patch-clamp electrophysiology, vascular surgery and stereotaxy (Degree of experimental surgery), study of glucose homeostasis (clamps, GTT, ITT), pharmacogenetics and optogenetics (patch-clamp)

Selected references


Dr. Diego Gomez-Nicola, PhD (University of Southampton, UK)

Biosketch

Dr. Diego Gomez-Nicola (DGN) obtained a degree in Biological Sciences (Neuroscience) by the Complutense University of Madrid, to start his PhD in Molecular Biology (Neurosciences) at the Autonoma University of Madrid, obtaining the doctorate in 2008. During his PhD at the Cajal Institute (Madrid, Spain), he studied the role of Interleukin-15, a proinflammatory cytokine, in the control of glial reactivity and inflammation in the CNS. After his first postdoctoral stage at the National Hospital of Paraplegics (Toledo, Spain), studying the impact of neuroinflammation on adult neurogenesis, Dr. Gomez-Nicola joined, in 2010, the CNS Inflammation Group of the University of Southampton, as a postdoctoral fellow of the Spanish Ministry of Education and Science (MEC) and later as an EU Marie Curie fellow, under the supervision of Prof. Hugh Perry. His postdoctoral research focused to studying the regulation of cellular proliferation in prion disease, with a special focus of the innate immune response and adult neurogenesis.

In 2013, thanks to a New Investigator Grant of the MRC, DGN started his independent research group. He joined the Faculty of Natural and Environmental Sciences (University of Southampton) as a Lecturer in 2016, and is now a Principal Research Fellow (Associate Professor) in Neuroscience. Since establishing his group, DGN has developed his ongoing research portfolio, for example studying preclinical therapeutic targeting of neuroinflammation in AD, using repositioning of existing drugs in collaboration with industrial partners, the dynamics of oligodendrocyte precursor cells in response to synaptic activity and in Alzheimer’s or the effect of neuroinflammation on adult neurogenesis. DGN has supervised Postdoctoral fellows, PhD, MSc, or project students in recent years, and the success of his projects and collaborations led to a number of research articles in prestigious peer-reviewed journals as well as invitations to present his work at national and international academic institutions and international meetings. Dr. Gomez-Nicola also has a track record as an organizer of scientific and outreach events and managing research communities, like the Spanish Glial Network or the Alzheimer’s Research UK South Coast Network, as well as an active role as Equality and Diversity Champion.

Selected references:


  - Comment in AlzForum "Ageing causes identity crisis in microglia"


Dr Andy Greenhalgh, PhD (INRA, Bordeaux, France)

Biosketch:

Andy Greenhalgh is neuroimmunologist and an Agreenskills+ Research Fellow at INRA, University Bordeaux. He obtained his PhD with Prof. Dame Nancy Rothwell at the University of Manchester, working on the role cytokines in brain ischaemia and haemorrhage. His postdoctoral work was performed at McGill University, Canada, in the laboratory Dr Sam David. Dr Greenhalgh’s fundamental research interests are focused the immune system’s role in central nervous system (CNS) injury and disease. More specifically, the role of inflammation after a physically traumatic event, such as a brain or spinal cord injury. He has made important contributions to the preclinical development of anti-inflammatory molecules for the treatment of stroke and is particularly interested in two cell-types involved in the immune response to CNS injury; microglia and macrophages. Microglia are the resident immune cell of the CNS, whereas macrophages infiltrate from the blood after CNS injury. Both cell types are thought to be to the recovery of brain and spinal cord tissue. Dr Greenhalgh’s work is now focusing on the interconnected role of microglia and macrophages and how lipid content and signaling could be crucial in their function.

Selected references:


Greenhalgh AD, Brough D, Robinson EM, Girard S, Rothwell NJ, Allan SM (2012) Interleukin-1 receptor antagonist is beneficial in rat subarachnoid haemorrhage by blocking haem driven inflammation. Disease Models & Mechanisms 6:823-33
Biosketch:

Dr. Luke Healy completed a B.Sc. (Hons) Neuroscience at University College of Cork (Ireland) and undertook his doctoral work at Trinity College Institute of Neuroscience in Trinity College Dublin under the supervision of Professor Kumlesh Dev.

His Ph.D works focused on the pharmacologic effects of a new multiple sclerosis disease modifying therapy, Gilenya, on human astrocytes. During his Ph.D Dr. Healy spent a year at the Novartis Institute for Biomedical Research (Basel, Switzerland) studying the functional antagonism of a class of GPCRs, the sphingosine-1-phosphate receptor family.

In 2014 Dr. Healy undertook his postdoctoral training in the laboratories of Drs. Jack Antel and Amit Bar-Or at the Montreal Neurological Institute (MNI), McGill University (Montreal, Canada) where he focused on the role of human myeloid cell populations in the pathogenesis of multiple sclerosis. His work using monocyte-derived-macrophages from patient populations in addition to primary human adult microglia derived from surgically resected tissues has shed light on the molecular processes of phagocytic uptake of myelin debris by these cell types.

Dr. Healy was appointed as a Professor (Assistant) in the Department of Neurology and Neurosurgery at the MNI in January 2018. Guided by the use of primary human microglia and microglia derived from multiple sclerosis and neurodegenerative disease patient-derived iPSCs, his group will examine how human microglia can provide a link between genetic risk factors, inflammation and neurodegenerative disease associated phenotypes. With the overarching aim of understanding the complex nature of human microglia activation, identifying novel microglia therapeutic targets and using pharmacological tools to shift microglia functionality, in an effort to combat chronic microglial inflammation.

Selected References:


Dr. Ana Belén López Rodríguez (Trinity College Dublin, Ireland)

Biosketch:

Doctor in Molecular Biomedicine at Autonoma University of Madrid (2015).

She did her degree in Biology at Complutense University of Madrid, combining it with collaborations in different projects of the Microbiology department in this same University and the Neuropathology unit of Cajal Institute in Madrid. After that, she finished her master in Molecular Biomedicine at Autonoma University of Madrid.

Her PhD was developed in the action of neuroprotective agents in brain injury models, with particular interest in sexual dimorphisms, and carried out her work at Complutense University and Cajal Institute in Madrid.

During her PhD, she did different scientific visits in Europe in which she learnt new techniques such as mass spectrometry (National University of Ireland, Galway) and traumatic brain injury model (Paris Descartes University).

After a short period as postdoc at Cajal Institute in Madrid, she moved to Ireland in 2016 to start her postdoc position in Trinity College Dublin. Her currently work in Colm Cunningham’s’s group is based in neurodegeneration and brain inflammation with special interest in the role of microglia and astrocytes; carrying out behavioural, molecular and immunohistochemical techniques. More recently, she has been taking part of a new project to study the dissociation of inflammation and fever effects on cognitive function and social skills in models of autism.

Selected references:


Dr. Barry McColl, PhD (University of Edinburgh, UK)

Biosketch:
Barry McColl obtained his PhD at the University of Glasgow, UK, where he investigated mechanisms underlying the association between APOE polymorphism and neuropathology relevant to cerebrovascular and Alzheimer’s disease. (e.g. PMID: 12507910, PMID: 16804548).

This was followed by postdoctoral work at the University of Manchester, UK, where the main focus of study was on how inflammatory conditions originating outside the CNS (e.g. infection, metabolic disease) modify neuroinflammatory, blood-brain barrier and pathological responses in the brain (e.g. PMID: 17442825, PMID: 18789376, PMID: 20200351, PMID: 19654587, PMID: 19826431). Further work explored the use of novel computational approaches to develop immunomodulatory treatments (PMID: 22020553).

He then moved in 2010 to The Roslin Institute, University of Edinburgh, UK, on a tenure-track fellowship where he established an independent research group, subsequently gaining tenure in 2014. In 2017, he took up a position as a programme leader in the UK Dementia Research Institute. His lab studies the influence of the immune system on CNS health, injury and disease with three main areas of current interest: (1) basic biology of microglia regulating their activity during the adult lifespan and control of the neuroimmune environment (e.g. PMID: 26780511, PMID: 28303091) (2) neuroimmune-mediated mechanisms of brain injury and repair in cerebrovascular and neurodegenerative disease (e.g. PMID: 26719249, PMID: 28722234) (3) mechanisms of brain injury-induced immunosuppression and susceptibility to systemic infection (PMID: 28422126).

Selected references:


Dr. Lydie Morel, PhD (INRA, Bordeaux, France)

Biosketch:

Lydie Morel is neuroscientist and a Post-Doctoral Research Fellow at NutriNeuro (https://www6.bordeaux-aquitaine.inra.fr/nutrineuro) an INRA and University of Bordeaux Research laboratory.

Her previous work was performed in Pr Yang’s lab at Tufts University, Boston. She focused on the neuro-glial crosstalk and its role in different pathologies of the CNS. She characterized a neuronal exosome-mediated miRNA pathway that regulates translational expression of GLT1 in astrocytes. The dysregulation of glutamate transporter GLT1 and its human homolog, EAAT2, has been involved in neurological and neurodegenerative disorders such as epilepsy and ALS, influencing the progression of these diseases. Dr Morel is now interested in the role of microglia in neuroinflammation and more specifically how Polyunsaturated Fatty Acids (PUFAs) can modulate the immune response, affecting the development of a functional neuronal network.

Selected References:

