

April  
2014

SCHOOL OF

# Biochemistry & Immunology



TRINITY  
COLLEGE  
DUBLIN

This academic year a number of research successes in the School of Biochemistry & Immunology have been presented in major international journals and conferences.

Much of our research focused on discovering the fundamental biochemical and immunological mechanisms that underlie human diseases such as cancer, rheumatoid arthritis, diabetes, Alzheimer's disease, Multiple Sclerosis and many more. The discipline of biochemistry is fundamental to all disease and our discoveries identify new targets that may be

important in developing novel treatments. Our undergraduate teaching courses are research-led and generate students with excellent skillsets and career prospects in areas such as biomedical research, industry, academia and business. Our home is the newly constructed Trinity Biomedical Sciences Institute on Pearse Street where we conduct most of our



Professor Gavin Davey, Head of School

teaching and research activities with the aid of really fantastic infrastructure and equipment. Please visit our website ([www.tcd.ie/biochemistry](http://www.tcd.ie/biochemistry)) for further information on all the ongoing research activities. If you need further information on any area please don't hesitate to email, phone or write to any of our research leaders!



Provost Dr Patrick Prendergast and Dr Mike Harrington, Vice President of Europe and Asia Pacific Operations, Waters Corporation

## Donation Of HPLC Equipment From Waters Corporation

The School of Biochemistry and Immunology and TBSI welcome the donation by the Waters Corporation of an Alliance HPLC system to the Institute.

Waters were represented by Dr Mike Harrington, an alumnus of our School and currently Vice President of Europe and Asia Pacific Operations at Waters. Head of School, Professor Gavin Davey, in whose laboratory the equipment was installed, explained how the analytical system will allow more advanced practicals to be designed for both undergraduate and advanced biochemistry and neuroscience

students. High-throughput quantitative analysis of brain neurotransmitters and glycoanalytics of tissue samples from patients with neurological disorders will now be possible. This will facilitate multidisciplinary collaborative research between clinicians, laboratory based scientists and industry, providing the best opportunity to find treatments quickly.

## Conference On Homocysteine And One-Carbon Metabolism

The negative impact of high blood levels of the amino acid homocysteine from pre-natal life to older age, its regulation by the vitamins folic acid and vitamin B12 and its implications for public health policy on food fortification were examined at the 9th International Conference on Homocysteine and One-Carbon Metabolism held in September 2013.



The conference, organised by Professor Anne Molloy was dedicated to the memory of Professor John Scott who died earlier in the year. His pioneering work here in Trinity College elucidated the connection between folic acid intake and the incidence of neural tube birth defects. His work contributed to the development of national and international public health policy on food fortification with folic acid. Food fortification

and its implication for human health were the focus of a special symposium held during the conference which brought together leading clinicians, clinical laboratory and molecular biologists, cardiologists, geriatric specialists and geneticists to bridge the gap between the clinical impacts of homocysteine, folic acid and vitamin B12 and our understanding of how these substances work in the human body.

## 10th International Symposium on Bordetella

The increased incidence of whooping cough was the focus of the 10th International Symposium on Bordetella held in September, 2013 in TCD. An acellular vaccine, introduced in the mid 1990s, proved effective and avoided the side effects seen with the whole cell vaccine but the immunity conferred falls quite quickly, necessitating frequent booster vaccinations. The international symposium, organised by Professor of Experimental Immunology, Kingston Mills, brought together scientists performing

cutting-edge research on the genetics, pathogenesis and immunology of *B. pertussis*, physicians working on the epidemiology and clinical aspects of pertussis, government agencies such as the US Centers for Disease Control (CDC), and representatives of the major vaccine manufacturing companies. Professor Mills' research team recently showed that the current vaccine could be improved by altering its adjuvant. This discovery should pave the way for an improved whooping cough vaccine.

## Keep In Touch

If you haven't done so, please register at Front Gate Online, TCD alumni community, allowing you to view and update your contact details, connect with other alumni and keep in touch.

[www.alumniconnections.com/olc/pub/TDD](http://www.alumniconnections.com/olc/pub/TDD)

## High-Achieving Student



Christopher Davitt, a PhD student in Professor Ed Lavelle's lab was awarded the prize for "The Best Strategic & Innovative Thinking" in the prestigious Accenture Leaders of tomorrow competition.

The competition was to design a new product or service and to construct a business plan to develop it. Chris's idea was a non-specific immune boosting supplement to be taken orally to boost key components

of the immune system during infection and to reduce recovery time and speed up illness resolution. Chris also developed a highly innovative and low cost research and production strategy to help his company overcome the high costs associated with entry into the biotech sector.

Chris was also the winner of the Science Foundation Ireland-sponsored 'National Thesis in 3' competition where postgraduates present their thesis work to a non-specialist audience with the added constraint that the presentation consists of only three slides of one minute's duration each.

## Outreach Activities: Immune Wars: Bugs & Beyond

Professors Rachel McLoughlin, Nigel Stevenson, Cliona O'Farrelly and James Harris were recently awarded a bursary by the Royal Dublin Society to develop an interactive "Science Live" lecture.

Their demonstration entitled "Immune Wars: Bugs & Beyond" aims to introduce primary school children to the concept of bacteria and to how our immune system defends against infection. The team shot a fun movie demonstrating where bacteria can lurk and how we culture these pathogens in the lab. The team also used interactive presentations to introduce the concept of bacteria and the immune system including a game of 'Phagocyte Catch' which involved the children splitting into teams of 'bacteria' and 'phagocytes'. The aim of the game was for the bacteria to infect (throw plastic balls) the body (a paddling pool), while the phagocytes defended the body (catching the balls using fishing nets). The team has visited a number of primary schools and the feedback from both children and teachers was very positive.

## Recent Publications



Professor Luke O'Neill's group have recently identified a role for mitochondria-derived succinate as an inflammatory signal and have drawn parallels with other metabolites such as NAD<sup>+</sup> and citrate whose roles have also expanded beyond metabolism and into signalling. The finding of an expanding repertoire of functions for these metabolites suggests that there may be a therapeutic potential in targeting mitochondrial pathways in inflammation-associated diseases.

(Tannahill, G.M. et al. (2013) Succinate is an inflammatory signal that induces IL-1beta through HIF-1alpha. Nature 496, 238-242, Mills, E., & O'Neill LA. (2013) Succinate: a metabolic signal in inflammation. Trends in Cell Biology Dec 19 2013 )



Professors Nigel Stevenson and Cliona O'Farrelly have discovered a new mechanism by which the Hepatitis C virus (HCV) evades anti-viral immunity. They found that the genotype 1 form of the virus can block the anti-viral interferon pathway. This finding also explains why so many patients infected with G1HCV fail to respond to interferon therapy. The discovery provides a potential for the development of novel therapeutics which the group is now investigating.

Stevenson et al (2013) Hepatitis C virus targets the interferon-JAK/STAT pathway by promoting proteasomal degradation in immune cells and hepatocytes FEBS Letts 587 (10) 1571-1578



A paper published in Nature by an international group including Professor Derek Nolan, Head of the Molecular Parasitology Laboratory, details the mechanism of infection of the African parasite *Trypanosome brucei Gambiense*, the causative agent of human sleeping sickness. This discovery offers a potential treatment mechanism for a hitherto intractable disease.

Uzureau P, et al (2013) Mechanism of *Trypanosoma brucei gambiense* resistance to human serum. Nature. 2013 Aug 21.

# Professor Colm Cunningham speaks at the NIH meeting on delirium “Delirium in Older Adults: Finding Order in the Disorder”

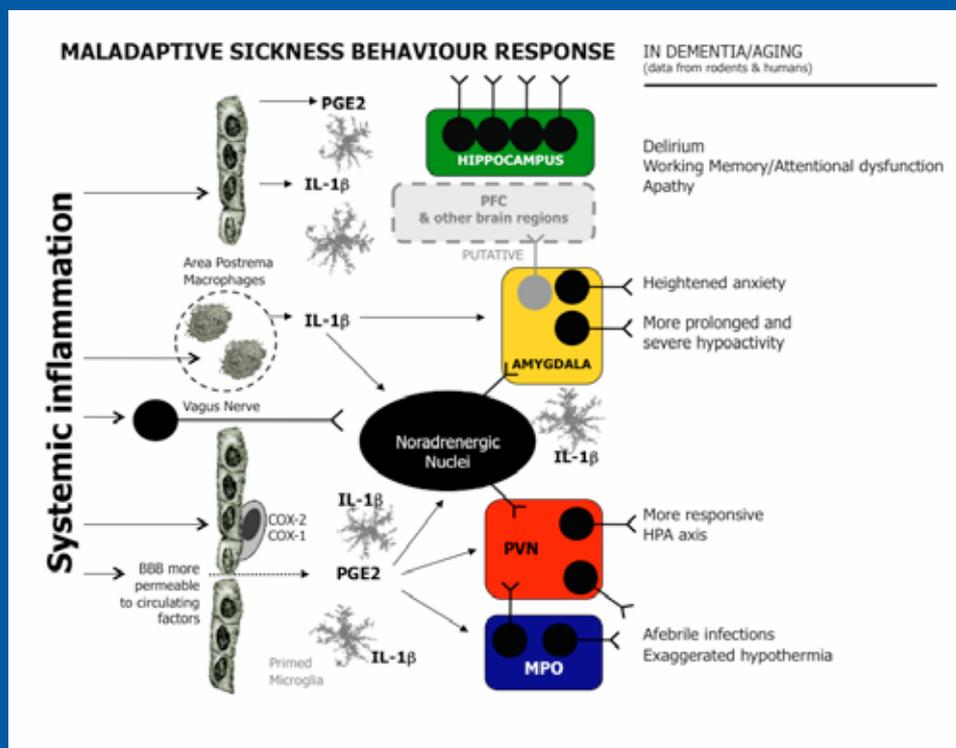
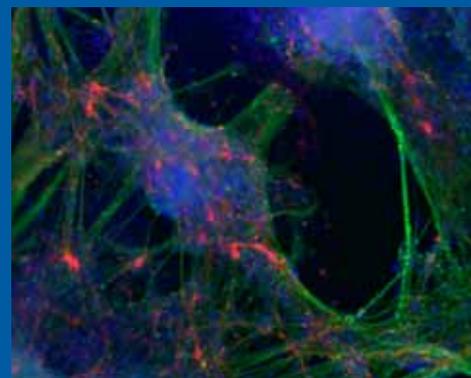
Professor Colm Cunningham was one of only two European researchers who presented their work at a recent major conference on delirium hosted by the US National Institutes of Health (NIH) in collaboration with the American Geriatrics Society. Professor Cunningham was invited by the NIH to present his work on animal models of delirium during dementia. Delirium is a common acute neuropsychiatric syndrome that produces extremely distressing episodes of cognitive and emotional disturbances with significant long-term consequences. Inflammatory insults such as infection, injury and surgery frequently trigger delirium

in intensive care unit patients, in elderly individuals and particularly in those with existing or evolving dementia. Professor Cunningham’s talk entitled ‘Inflammatory mediators in delirium: where the neural circuitry of sickness syndrome and dementia meet’ examined the relationship between systemic inflammation and brain responses in the normal brain and contrasted these with the consequences of the same insults on the degenerating brain in model systems and in patient groups. The work underpinning his presentation is synthesized in a recent review

(Cunningham C & MacLullich AM, (2013) Brain, Behavior & Immunity 28 1-13).

## Education

Researchers in the School of Biochemistry and Immunology including Professor Gavin Davey and Dr Andrew McDonald and their European partners have secured €3.8 million for a prestigious Marie Curie PhD training network project, ‘Training in



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