NTU DOCTORAL SCHOOL

NOTTINGHAM TRENT UNIVERSITY

"Creating future innovators and impact for education, industry, the professions and society"

Nottingham Trent University
Doctoral School
School of Science and Technology
PhD Projects – 2016

Broad area of research – Biomedical and Biological Sciences

Welcome to the Nottingham Trent University Doctoral School

The Doctoral School provides a supportive environment and a thriving research culture that encourages you to reach your full potential as a research degree student.

Valuing ideas, enriching society

We encourage new ideas and new ways of thinking across the whole University through a culture of discovery and innovation. We believe our research has the potential to impact the world we live in and change lives.

Research excellence

Our research is recognised across the world. In the most recent Research Excellence Framework (Ref 2014) most of our research was considered internationally-excellent or world-leading.

The University is committed to developing and expanding its activity to increase the scope, quality and impact of our research.

Be part of our research

With MPhil, PhD and Professional Doctorate research degree opportunities across each of our academic schools, we support students conducting research in a diverse range of areas. Our research students form an important part of our research community and make a significant contribution to our activity.

We offer full-time, part-time and distance learning research degree opportunities.

Our Professional Doctorates offer you the opportunity to contribute to research in your profession while attaining a research qualification.

A supportive community

We are committed to supporting and developing our research students.

You will have academic, administrative and personal support throughout your studies and access to dedicated workspace and exceptional facilities.

Excellent support throughout your studies

The Doctoral School aims to provide excellent personal and practical assistance for our research students creating a supportive and pro-active environment.

Support and guidance

Your main source of advice and support will be your own doctoral supervisory team, which will include a director of studies and at least one other supervisor. This team will be selected based on their experience in your chosen area of study or their background in relevant practice.

The Doctoral School Team will be available throughout your studies. Our dedicated team will offer advice and guidance for your initial enquiry and application and introduce you to the University and to your supervisory team.

Outstanding facilities

As a research student at NTU you will have access to a wealth of facilities and resources to aid and enhance your studies. The University is committed to providing the best possible facilities for all its students and we are constantly investing in new facilities and learning environments.

Dedicated study areas

All our research students are able to use study and writing areas giving you access to desks, laboratories and IT facilities when you need it.

Learning resources

Students at Nottingham Trent University have access to a wealth of library materials including over 480,000 books and 1,300 printed journals, as well as an extensive audio-visual collection of DVDs, videos and slides.

Electronic library resources are an increasingly important part of the support offered to research students, and more than 290 databases and 17,000 eJournals are accessible from any networked PC within NTU, or from your home or off-campus PC.

Our experienced and knowledgeable library staff will help guide you to the most useful sources of information.

Developing the next generation of researchers

We aim to nurture research talent and help our students thrive through their research degrees and into their future careers.

Researcher Development Programme

All research students are expected to participate in a rolling programme of professional development. You will have the opportunity to attend a range of workshops and developmental activities mapped to the Vitae Researcher Development Framework (RDF).

Our Research Development Programme empowers you – in discussion with your supervisory team – to create an individualized package of activities to support your career development as a researcher.

A range of core activities will support your journey from enrolment at NTU as a research student, through to final submission of your thesis. These activities will be complemented by a series of electives that you will choose to pursue, depending upon your developmental needs as you progress in your research work.

Developing your career

We pride ourselves on equipping our students with knowledge and skills and encouraging initiative, innovation and excellence.

Our research students are encouraged to take part in conferences, seminars and external networks. These are an excellent opportunity for you to share your work, meet other researchers and build a network of contacts.

Our own research conferences and seminars offer you the opportunity to present and discuss your work among the NTU research community.

You may also have the opportunity to teach undergraduate students or supervise laboratory work.

School of Science and Technology

Research in the School of Science and Technology is rich and diverse, with staff conducting internationally recognised and world-leading research. Research is clustered in Research Centres and units, providing a focus for different themes with their underpinning platforms:

- **Biomedical Sciences and the John Van Geest Cancer Research Centre**

Internationally excellent research environment – Our Biomedical Research is world-leading and involves staff with broad academic backgrounds, including Biochemistry, Bioinformatics and Biomathematics, Analytical/Synthetic Medicinal Chemistry, Immunology, Microbiology and Pharmacology. In the recent REF2014 assessment (http://www.ref.ac.uk/) of University research quality the Biomedical Sciences Research Unit's submission (to UoA A03) was highly rated, having 86% of overall activity at the highest 3* (internationally excellent) and 4* (world-leading) grades. This included achieving 100% of its impact at 3* and 4* levels.

- **Materials and Engineering**

Internationally excellent research environment – Our multidisciplinary Materials and Engineering Research is extremely strong in terms of high quality outputs, income generation, and international impact. In the recent REF2014 assessment of University research quality our Materials and Engineering Unit's submission (to UoA B15) was highly rated, having 84% of overall activity at the highest 3* (internationally excellent) and 4* (world-leading) grades. This included achieving a joint 7th rank out of 62 submitted UK institutions for the quality of our publications, which were judged as attaining 94.6% at 3* and 4* levels.

- **Computing and Informatics**

Internationally excellent research impact- The multi-disciplinary research is directed to address important questions and is clustered under three themes: Interactive Systems for cognitive and physical rehabilitation and mental wellbeing; Computational Intelligence and Applications for computationally intelligent methods and techniques; and Intelligent simulation, modelling and networking. In the recent REF2014 assessment of University research quality the Computing and Informatics Research Unit's submission (to UoA B11) was highly rated achieving 80% of its impact at 4* and 3* levels.

- **Sport, Health and Performance Enhancement (SHAPE) Research Centre**

Internationally excellent research outputs- In the recent REF2014 assessment (http://www.ref.ac.uk/) of University research quality the Sport Sciences Research Unit's submission (to UoA C26) was highly rated, having 94% of the outputs rated at the 3* (internationally excellent) and 2* (internationally recognised) grades. Our Sports Science research is multi-disciplinary and is clustered under a number of themes, driven by the Musculoskeletal Physiology, Sports Performance, Exercise and Health and Sport in Society Research Groups.

Research themes and areas

These research units promote the research excellence and facilities within the School, and stimulate knowledge transfer, innovation and exploitation. They provide strategic direction in research planning and portfolio development, and ensure that mechanisms are in place to nurture research.

List of available projects and a summary description of them are provided in the following research categories.

- Biomedical Sciences and the John Van Geest Cancer Research Centre
- Computing and Informatics
- Materials and Engineering
- Sport, Health and Performance Enhancement Research Centre

Or they can be searched based on the following academic Departments.

- Biomedical and Biological Sciences
- Chemistry and Forensic Sciences
- Computing and Technology
- Physics and Mathematics, and
- Sport Science

Project Titles (descriptions below)

1. Prof. Graham Ball - The systems biology of PARP and PARP inhibitors in breast cancer

2. Prof. Graham Ball - Diagnostic and Prognostic Markers of Sepsis in an Intensive Care setting

3. Prof. Graham Ball - Systems Biology methodologies for the identification of molecular drivers in breast cancer

4. Dr. Adam Bates - The ecological diversity of orchards.

5. Dr. Luigi De Girolamo - Assessment of drug-induced mitochondrial toxicity in hepatic and neural cell models

6. Prof. Stephen Forsythe - Determining variation in surface structures of the neonatal pathogen Cronobacter

7. Prof. Stephen Forsythe - Identifying and typing intestinal bacteria from premature neonates.

8. Dr. Fiona Freeman - Amyloid Precursor Protein: a potential therapy for the treatment of dementias

9. Dr. Karin Garrie - Elucidation of novel factors driving pancreatic β-cell dysfunction in type 2 diabetes

10. Dr. Alan Hargreaves - Transglutaminase and its substrates as potential biomarkers of Alzheimer's disease

11. Dr. David Hughes - Identification of novel antimicrobial peptides from reptiles

12. Dr. David Hughes - Identification of ZP genes from reptiles and birds

13. Dr. Michael Loughlin - Development of Colistin resistance in Antibiotic resistant Enterobacteriaceae

14. Dr. Georgina Manning - Disinfectant resistance acquired by Campylobacter and associated changes in virulence

15. Dr. Georgina Manning - Investigation of Pathogenesis of Compylobacter Jejuni

16. Dr. Cristina Montiel-Duarte - Role of microtubules in chronic myeloid leukaemia resistance

17. Dr. Cristina Montiel-Duarte - A possible long non-coding RNA as a biomarker for prostate cancer

18. Dr. Carl Nelson - The impact of inflammation on G protein-coupled receptor regulation in human airway epithelial cells

19. Dr. Shiva Sivasubramaniam - Understanding the effects of high glucose on trophoblast cell behaviour, proliferation and invasion

20. Dr. Shiva Sivasubramaniam - Establishment and characterization of stem-like cells from human trophoblast and choriocarcinoma

21. Dr. Shiva Sivasubramaniam - The effects of atmospheric air quality and particle pollution on trophoblast invasion

22. Dr. Shiva Sivasubramaniam - The effects of bioflavonoids in reducing placental oxidative stress and trophoblast apoptosis

23. Dr. Rachel Stubbington- Aquatic-terrestrial invertebrate community dynamics in temporary stream ecosystems

24. Dr. Christian Thode - Evaluation of palliative interventions in models of ischemic stroke

25. Dr. Christopher Tinsley - Neurotransmitter receptor characterisation of input and outputs connections

26. Dr. Christopher Tinsley - Using neuronal stem cells to promote brain re-wiring: in vitro and in vivo studies.

27. Dr. Mark Turner - Protecting pancreatic β-cell function in type 2 diabetes

28. Dr. Elisabetta Verderio Edwards - Novel biomarkers in breast cancer

29. Dr. Elisabetta Verderio Edwards - Development of selective phototherapy treatment for breast cancer

30. Dr. Jody Winter - The bacteriophages of Helicobacter pylori

1.
THE SYSTEMS BIOLOGY OF PARP AND PARP INHIBITORS IN BREAST CANCER

Breast cancer is the most common cancer in women. One sub type of breast cancer, the triple negative or basal phenotype is particularly difficult to treat. PARP inhibitors are one approach to the treatment of such cancers. These however are only effective in a subset of cases. Within this doctoral studentship, through molecular profiling of cases and understanding the systems biology and molecular pathways associated with PARP, it is anticipated that a greater molecular understanding of PARP will be achieved, with the potential to identify putative new PARP inhibitors. Furthermore treatment of cell cultures with current PARP inhibitors and knocking out putative PARP inhibitors will allow further investigation and validation of the findings.

References

- TAREK M.A. ABDEL-FATAH, et al ...GRAHAM BALL, IAN O. ELLIS, NICOLA J. CURTIN, SRINIVASAN MADHUSUDAN 2014. Untangling the ATR-CHEK1 network for prognostication, prediction and therapeutic target validation in breast cancer. Molecular Oncology. Volume 9, Issue 3, March 2015, Pages 569–585
- POWE, DESMOND G., GOPAL KRISHNA R. DHONDALAY, et al AND GRAHAM R. BALL. 2014. DACH1: Its Role as a Classifier of Long Term Good Prognosis in Luminal Breast Cancer. PloS one 9, no. 1 (2014): e84428.
- LANCASHIRE L. J., POWE D. G., et al ELLIS I. O., BALL G. R.. (2009) A validated gene expression profile for detecting clinical outcome in breast cancer using artificial neural networks. Breast Cancer Res Treat. Volume 120, Number 1, 83-93,
- LANCASHIRE LJ., LEMETRE C AND BALL GR, 2009. An introduction to artificial neural networks in bioinformatics : application to complex microarray and mass spectrometry datasets in cancer studies. Briefings in Bioinformatics 10 (3): 315-329.

Supervisors: Prof. Graham Ball

Supervisor biogs

Prof Graham Ball has 20 years' experience as a clinical computational biologist and is internationally recognised in the field. In this period he has developed a number of approaches based on Artificial Neural Network technologies for the identification of biomarkers and key molecular drivers from large genomic and proteomic data sets. Graham has spent many years bridging the gap between clinical sciences, biosciences and bioinformatics. The majority of this work has been in collaboration with a number of prominent international clinical groups in the areas of cancer and infectious diseases. He has lead the bioinformatics group in an EU FP6 Network of excellence, participated as a data analyst in 4 successful EU consortia and is currently the molecular diagnostics lead for van Geest Cancer research Centre. He has over 110 clinical informatics / biomarker papers and is named on 4 patents.

Entry Requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree

(or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biological science.**

Contact: graham.ball@ntu.ac.uk for informal discussions.

2.
DIAGNOSTIC AND PROGNOSTIC MARKERS OF SEPSIS IN AN INTENSIVE CARE SETTING

Sepsis remains a major cause of mortality globally. The management of such cases is highly dependent on rapid decisions regarding the nature of the disease and biomarkers that will allow this. There is currently a lack of biomarkers that will facilitate the rapid diagnosis of cases in an intensive care setting. However the utilisation of molecular techniques will facilitate the profiling of such cases. Analysis of this data using bioinformatics and systems biology techniques will allow the discovery clinical biomarkers. The Ball group at NTU also have access to a wealth of such data and extensive experience using the algorithms to analyse it. This project will focus on the identification of biomarkers of sepsis from a rich gene expression array data set. Once identified the biomarkers will be validated in clinical samples in collaboration with Cardiff University. It is further anticipated that the key molecular drivers of disease will be identified using systems biology approaches.

References

- Lancashire et al, 2010. Dhondalay et al, 2014.

Supervisors : Prof. Graham Ball

Supervisor biogs

Prof Graham Ball manages a vibrant team of bioinformaticians and molecular biologists at NTU. He has supervised over 16 doctoral students to completion and has supervised over 60 masters student projects from a wide range of backgrounds.

Entry Requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biological sciences.**

Contact: graham.ball@ntu.ac.uk for informal discussions.

3.
SYSTEMS BIOLOGY METHODOLOGIES FOR THE IDENTIFICATION OF MOLECULAR DRIVERS IN BREAST CANCER

Scientific activities undertaken in the post genomic era have generated a huge volume of publicly available genomic and transcriptomic data. The approaches available for analysis of this data are often limited and not fit for purpose. One of the key criticisms faced is that there are inconsistencies between the biomarkers identified across different data sets and between different methods. This project further develops an existing set of robust methodologies in order to find the key molecular drivers associated with different phenotypic characteristics in breast cancer and to integrate findings across multiple data sets and across multiple algorithms.

References

- TAREK M.A. ABDEL-FATAH, et al ...GRAHAM BALL, IAN O. ELLIS, NICOLA J. CURTIN, SRINIVASAN MADHUSUDAN 2014. Untangling the ATR-CHEK1 network for prognostication, prediction and therapeutic target validation in breast cancer. Molecular Oncology. V. 9, Issue 3, March 2015, Pages 569–585
- POWE, DESMOND G., GOPAL KRISHNA R. DHONDALAY, et al AND GRAHAM R. BALL. 2014. DACH1: Its Role as a Classifier of Long Term Good Prognosis in Luminal Breast Cancer. PloS one 9, no. 1 (2014): e84428.
- LANCASHIRE L. J., POWE D. G., et al ELLIS I. O., BALL G. R.. (2009) A validated gene expression profile for detecting clinical outcome in breast cancer using artificial neural networks. Breast Cancer Res Treat. Volume 120, Number 1, 83-93,
- LANCASHIRE LJ., LEMETRE C AND BALL GR, 2009. An introduction to artificial neural networks in bioinformatics : application to complex microarray and mass spectrometry datasets in cancer studies. Briefings in Bioinformatics 10 (3): 315-329.

Supervisors: Prof. Graham Ball

Supervisor biogs

Prof Graham Ball has 20 years' experience as a clinical computational biologist and is internationally recognised in the field. In this period he has developed a number of approaches based on Artificial Neural Network technologies for the identification of biomarkers and key molecular drivers from large genomic and proteomic data sets. Graham has spent many years bridging the gap between clinical sciences, biosciences and bioinformatics. The majority of this work has been in collaboration with a number of prominent international clinical groups in the areas of cancer and infectious diseases. He has lead the bioinformatics group in an EU FP6 Network of excellence, participated as a data analyst in 4 successful EU consortia and is currently the molecular diagnostics lead for van Geest Cancer research Centre. He has over 110 clinical informatics / biomarker papers and is named on 4 patents.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree

(or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biological Sciences or related.**

Contact: graham.ball@ntu.ac.uk for informal discussions.

4.
THE ECOLOGICAL DIVERSITY OF ORCHARDS

There are two main types of orchard: (1) modern orchards, whose main purpose is to produce as large a yield as possible using modern agronomic methods; and (2) traditional orchards, which were originally designed for yield, but are now eclipsed in this respect by modern orchards. Both support wildlife, but traditional orchards support a remarkable diversity of wildlife including many rare species (e.g. Noble Chafer [Gnorimus nobilis] beetles, and Lesser Spotted Woodpecker [Dendrocopos minor]).
There are several reasons why they are such important havens for wildlife, perhaps the foremost of which is their diverse mix of fruit trees of varying ages. It is hundreds of years before an oak tree supports deadwood specialist invertebrates and birds; a plum tree can take just 50. As individual fruit trees die saplings are replanted; so that a traditional orchard has young trees, trees in their prime and gracefully declining trees in old age.

For a long time traditional orchards were not deemed wildlife conservation resources because they are human constructs, but in the past few decades there has been a growing realisation that these habitats are critically important. Unfortunately they are declining rapidly in both number and extent, which means that many orchards have disappeared before anyone knew anything of their ecological diversity. This project sets out to start to fill this knowledge gap; identifying species of beetle, bee, plant and bird associated with traditional orchards. Type of management (e.g. grazing, gap filling, dead wood removal, agrochemical use), orchard design (e.g. orchard size, tree spacing, fruit varieties, root stock), and landscape factors (e.g. proximity of orchards and woodland, altitude) are all likely to influence the species that use an orchard as habitat, and these factors will also be investigated to help inform future traditional orchard management and conservation.

References

Orchard ecology and conservation is a new and developing field, so relevant papers are still rare.

- Bates A, Blake M, Harvey D, Bower L, Alexander L, Jenkins L, Sadler J, McKeown N, Shaw P, Gange A, Green H. 2013. Introduction to the Noble Chafer Gnorimus nobilis (Linnaeus, 1758) Leverhulme research project. Worcestershire Record 35(Nov): 6-8.
- Bates AJ et al. 2014. Garden and landscape-scale correlates of moths of differing conservation status: significant effects of urbanization and habitat diversity. Plos One 9(1): e86925.
- Barker, S., Burrough, A., Cordrey, L., Merry, K., & Wedge, C. (2011) Conserving the wildlife of traditional orchards. British Wildlife, 23, 8-16.
- Robertson, H. & Wedge, C. (2008). Traditional orchards and the UK Biodiversity Action Plan. In Orchards and groves: their history, ecology, culture and archaeology. Landscape Archaeology and Ecology, Vol. 7 (ed. by I.D. Rotherham). Wildtrack Publishing, Sheffield.

Supervisors: Dr. Adam Bates

Supervisor biogs

Dr Bates has more than ten years' experience researching the ecology and conservation of wide-ranging taxa (e.g. beetles, flowering plants, bees, wasps, spiders and moths) in a variety of semi-natural and human-made habitats/ecosystems (e.g. green roofs, urban areas, riparian zones, gardens), publishing more than 20 scientific papers and book chapters in these subject areas. He was recently part of a Leverhulme funded project on the ecology of orchards in collaboration with researchers from the University of Birmingham, Aberystwyth University and Royal Holloway University.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Ecology or environmental science related.**

Contact: adam.bates@ntu.ac.uk for informal discussions.

5.
ASSESSMENT OF DRUG-INDUCED MITOCHONDRIAL TOXICITY IN HEPATIC AND NEURAL CELL MODELS

Mitochondrial dysfunction is increasingly implicated as an adverse "off-target" effect of a number of pharmaceutical compounds. This has resulted in the withdrawal of drugs from the market due to toxicity concerns linked to mitochondria. The early evaluation of mitochondrial toxicity using defined cellular assays could identify problems early within the drug-development process, thereby improving drug safety and reducing late stage drug attrition.

Mitochondria participate in a variety of cellular functions and can vary dramatically in number and function in the cell type in which they are found. Drug-induced mitochondrial impairment typically affects the most aerobically demanding tissues (e.g. heart, kidney) and tissues exposed to higher concentrations of the drug via accumulation and bioactivation (e.g. liver). Subsequently, mitochondrial toxicity is most frequently evaluated in these tissues. However, the difference in susceptibility and response of mitochondria from tissue specific locations is not clear. Indeed, information on the susceptibility of mitochondria of neural origin has not been fully investigated. This is pertinent for lipophilic compounds that could traverse the blood brain barrier and have adverse mitochondrial effects on cells of neural origin, due to their high aerobic demand, mitochondrial density and the varied functions mediated by brain mitochondria.

The proposed project will study the effects of lipophilic therapeutic agents on mitochondrial function in human cell lines of neural and hepatic origin. This will involve the evaluation of key specific mitochondrial endpoints and supported by the assessment of the mitochondrial proteome to identify a panel of neural and hepatic specific mitochondrial markers of toxicity.

Supervisors: Dr. Luigi De Girolamo

Supervisor biogs

This project will bring together a strong supervisory team with a track record of producing internationally recognized research in the areas of mitochondrial dysfunction (see example publications). The DoS (LDG) and second supervisors (AJH and EEB) all being members of the REF submission holding outputs deemed to be internationally excellent in terms of originality, significance and rigour. The team has a long record of PhD project collaboration producing outputs and successful completions

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biochemistry/Cell biology or related discipline.**

Contact: luigi.de-girolamo@ntu.ac.uk for informal discussions.

6.
DETERMINING VARIATION IN SURFACE STRUCTURES OF THE NEONATAL PATHOGEN CRONOBACTER

We have a considerable research publication record on the bacterium Cronobacter, which is associated with severe baby infections. Our research spans across isolation and identification, through to DNA fingerprinting, through to genomic analysis. One of our most important discoveries is that we have identified a specific clonal lineage which is associated with neonatal meningitis. However we do not have information on links between the bacterial cells surface and host cell, which will be the primary route of infection. Therefore this project aims to explore the variation between outer membrane proteins, capsules and serotypes. Methods used would include molecular biology, PCR probes, and bioinformatic analysis of bacterial genomes and could include tissue culture but no animal research. Our research publication list and additional background can be obtained from www.foodmicrobe.com/publications.htm.

Supervisors: Prof. Stephen Forsythe

Supervisor biogs

Prof SJ Forsythe: Professor of Microbiology, 17 PhD completions, 90 peer reviewed publications. Homepage: www.foodmicrobe.com. Expert advisor to WHO, and UK Food Standards Agency. Co-developed chromogenic agar for the specific detection of Cronobacter which has been adopted as industrial standard. Established the Cronobacter multilocus sequence typing scheme, which includes an open access online database with over 1000 strains and over 100 bacterial genomes. Discovered the link between C. sakazakii and neonatal meningitis.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Microbiology or related discipline.**

Contact: Stephen.forsythe@ntu.ac.uk for informal discussions.

7.
IDENTIFYING AND TYPING INTESTINAL BACTERIA FROM PREMATURE NEONATES

Premature babies are highly susceptible to infection from carers (nurses & parents) and their feeds (breast milk & formula). This project will identify the gut bacteria from premature babies at two local hospitals. The student will discover whether the babies have the same bacterial strains, and whether this is affected by their feeding regimes (ie. breast feed or formula feed). The student will also compare the bacteria between new born twins, and whether surgery or antibiotic use has affected the babies' gut flora. The project has full ethical approval, and is part of the University's preparation for the next REF2020 research evaluation. The project is a continuation of the previous project also concerning infant feeding which was recognised as world-leading in the REF2014 evaluation, and was one of the 3 projects which led to the University's Queens Award 2016.

References

- Alkeskas, A., Ogrodzki, P., Saad, M., Masood, N., Rhouma, N., Moore, K., Farbos, A., Paszkiewicz, K., & Forsythe, S. (2015) The molecular characterisation of Escherichia coli K1 isolated from neonatal nasogastric feeding tubes. BMC Infectious Disease 15:449.
- Masood, N., Moore, K., Farbos, A., Paszkiewicz, K., Dickins, B., McNally, A., & Forsythe, S.J. (2015) Genomic dissection of the 1994 Cronobacter sakazakii outbreak in a French neonatal intensive care unit. BMC Genomics 16:750.
- Hurrell, E., Kucerova, E., Loughlin, M., Caubilla-Barron, J., Hilton, A., Armstrong, R., Smith, C., Grant, J., Shoo, S.& Forsythe, S. (2009) Neonatal enteral feeding tubes as loci for colonisation by members of the Enterobacteriaceae. BMC Infectious Diseases 9:146
- Hurrell, E., Kucerova, E., Loughlin, M., Caubilla-Barron, J. & Forsythe, S.J. (2009) Biofilm formation on enteral feeding tubes by Cronobacter sakazakii, Salmonella serovars and other Enterobacteriaceae. Intl. J. Food Microbiol.136.

Supervisors: Prof. Steve Forsythe

Supervisor biogs

Professor Forsythe has received international recognition for his studies of the neonatal bacterial pathogen, Cronobacter. This research area formed one of the three Case studies submitted for REF2014 and was recognised as 4* (world-leading). To date he has identified a pathovar of the bacterium C. sakazakii (ST4) which causes the majority of severe meningitis cases. His current research has now expanded to include bacterial microboime studies and is undertaking and longitudinal study of the neonatal microbiome. His is also a recognised expert in food safety, and is currently on the UK FSA committee, as well as having previous advisory roles to EFSA and WHO. He has supervised over 20 PhD students and approximately 100 peer reviewed publications.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st

Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Microbiology or similar discipline.**

Contact: Stephen.forsythe@ntu.ac.uk for informal discussions.

8.
AMYLOID PRECURSOR PROTEIN: A POTENTIAL THERAPY FOR THE TREATMENT OF DEMENTIAS

Accumulation of the peptide, A?, is associated with Alzheimer's disease. This is due to excessive breakdown of APP. However, two other closely related genes, APLP1 and APLP2, have been shown to have similar physiological properties to APP but do not produce A? aggregates. The aim of this proposal is to identify a mechanism that induces APLP variants, whilst diminishing APP expression, that facilitate memory, with minimal non-specific effects.

We have previously identified key molecules involved in the cascade of events that underlie synaptic modification. These included c-fos/c-jun/AP-1 and Arc 2,3,5,13 that occur during two distinct waves of neuronal activity1,4,7, the role of mitochondria4,5,6,8,9 and gap junctions11 & glutamate receptors3,10,12. Preliminary data has shown that the aforementioned cascade plays a pivotal role in determining which member of the APP family is expressed. A number of molecular biological, protein chemistry, tissue culture and behavioural techniques will be employed in this exciting project.

Supervisors: Dr. Fiona Freeman

Supervisor biogs

The supervisory team have established research laboratories. FF has been working in the field of behavioural pharmacology, protein chemistry and molecular biology since 1989. She has worked in world renowned laboratories throughout the world. She has established behavioural facilities both in the UK and Australia as well as developing novel techniques3,11 to address this hypothesis driven project. She has been involved in the supervisory team involved in the successful completion of PhD project, one of which she as a director of studies at NTU.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Pharmacology / Neuroscience or related discipline.**

Contact: Fiona.freeman@ntu.ac.uk for informal discussions.

9.
ELUCIDATION OF NOVEL FACTORS DRIVING PANCREATIC B-CELL DYSFUNCTION IN TYPE 2 DIABETES

Hyperglycaemia and hyperlipidaemia together contribute to the gradual loss of beta-cell function observed in patients with type 2 diabetes mellitus (T2D). In addition to the failure of compensatory hypersecretion to overcome insulin resistance, reduction in beta-cell mass through increased apoptosis and defective beta-cell regeneration is a key component of T2D. In order to begin to determine some of the key components associated with this process Dr. Turner's group has generated both Affymetrix microarray data and whole genome copy number data showing that ~10% of pancreatic beta-cell genes undergo >2-fold change in gene expression following 72h incubation in media supplemented with high levels of glucose and fatty acids. This indicates the likely involvement of specific genes which we have identified to a diverse range of cellular functions, including: inflammation and apoptosis; vesicular transport and insulin secretion; cell cycle and proliferation; telomere maintenance and nucleic acid fidelity. Predictive bioinformatic analysis using both standard and neural net software algorithms has further identified a number of novel intracellular signaling pathways linked to each of the above project areas. This data will form the platform for PhD projects in any of the above identified areas of biology. Using both over-expression and RNAi knock-down strategies, coupled to functional endpoints (e.g. NF-kappaB activation, insulin ELISA, Ki67 activity), these investigations will elucidate mechanisms of β-cell dysfunction that drive diabetogenesis and diabetes progression.

Supervisors: Dr. Karin Garrie

Supervisor biogs

This project fits within an integrated programme of ongoing diabetes transcriptomics projects at Nottingham Trent University under the leadership of Dr. Mark Turner, Associate Professor in Biomedical Molecular Biosciences.Extensive expertise in predictive pathway analysis also underpins this project and is provided through the co-supervisor, Prof. Graham Ball, Professor in Bioinformatics.Extensive expertise in predictive pathway analysis also underpins this project and is provided through the co-supervisor, Prof. Graham Ball, Professor in Bioinformatics.

Between them the supervisors have supervised >20 students to successful PhD award. Both also have a track record of successful grant capture from numerous external funding bodies (e.g. Diabetes UK, NovoNordisk UK Research Foundation, The Royal Society, Medical Research Council, European Union) and regularly publish in leading international biomedical journals.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **bioscience or biomedical discipline.**

Contact: Karin.garrie@ntu.ac.uk for informal discussions.

10.
TRANSGLUTAMINASE AND ITS SUBSTRATES AS POTENTIAL BIOMARKERS OF ALZHEIMER'S DISEASE

Tissue transglutaminase (TG2) is a Ca2+ dependent protein cross-linking enzyme that catalyses a variety of posttranslational modifications to proteins such as polyamine incorporation, deamidation and protein cross-linking. It has been shown in numerous research studies that the crosslinking activity of tissue transglutaminase is up-regulated in several neurodegenerative diseases, including Alzheimer's disease (AZD). It is therefore possible that cross-linked proteins represent potential early biomarkers of AZD. The aims of this project are to identify protein changes that occur at an early stage following exposure of nerve cells to β-amyloid peptide, a known causative agent of AZD. The work will initially be carried out using a human neural progenitor stem cell based model of AZD and the molecular changes identified by a range of approaches, including indirect immunofluorescence staining, microtitre plate assays of TG2 activity using a biotin-labelled amine substrate, biotin labelled protein enrichment strategies, 2D-PAGE, western blotting and mass spectrometry. We will then investigate whether the same biomarker changes occur in human tissue and serum samples in order to determine which of them could serve as early biomarkers of the disease. This study will apply cutting edge stem cell research to further understanding of the involvement of TG2 associated protein modifications in AD and their potential usefulness as biomarkers of AD progression. The findings will also facilitate the design of strategies to reduce cellular damage and potentially block or delay progression of the disease process.

References

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- Harris, W., Sachana, M., Flaskos, W., and Hargreaves, A.J. (2009) Proteomic analysis of differentiating neuroblastoma cells treated with sub-lethal neurite inhibitory concentrations of diazinon: identification of novel biomarkers of effect. Toxicology & Applied Pharmacology 240, 159-165.

Supervisors: Dr. Alan Hargreaves

Supervisor biogs

The project has a highly experienced team of supervisors, two of whom have been regular contributors to REF and previous research assessment exercises. The project combines expertise from the three supervisors to enable a multi-disciplinary approach combining a wealth of expertise cell biological, biochemical and bioinformatics approaches to a key study in the search for novel biomarkers of AD.

Dr Alan J Hargreaves has supervised 10 PhD students to completion as DoS (3 currently under supervision) and 15 PhD students as co-supervisor (5 currently under

supervision). Professor Graham Ball and Dr PLR Bonner have supervised more than 20 PhD students to completion between them either as DoS or co-supervisors

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Cell Biology, Biochemistry or related discipline.**

Contact: alan.hargreaves@ntu.ac.uk for informal discussions.

11.
IDENTIFICATION OF NOVEL ANTIMICROBIAL PEPTIDES FROM REPTILES

Beta-defensins are small anti-microbial peptides that are part of the innate immune system. These peptides are found throughout animal species, and are rapidly evolving as part of the pathogen response system. The project will involve the use of Bioinformatics, proteomics and molecular techniques to identify and characterize novel beta-defensins from reptiles. These peptides will be assessed for their anti-bacterial activity.

Supervisors: Dr. David Hughes

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biological Science or related discipline.**

Contact: david.hughes02@ntu.ac.uk for informal discussions.

12.
IDENTIFICATION OF ZP GENES FROM REPTILES AND BIRDS

The vertebrate egg envelope is composed of a set of related proteins (ZP proteins), which are critical in protection of the oocyte and the early embryo, and in sperm-egg interaction. We have previously demonstrated that the repertoire of ZP proteins in vertebrates is dynamic (Hughes, 2007; Connor & Hughes, 2003, Smith et al 2005; Lefievre et al. 2005; Connor et al 2005). To date the ZP gene complement of reptiles has now been described, and we have been data mining available genomic sequences to identify ZP genes from reptiles and from birds. The project will continue the identification of these genes, and will feed into the development of a novel immunocontraceptive strategy to control pest bird and reptile species with a species-specific strategy.

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Supervisors: Dr. David Hughes

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biological Science or related discipline.**

Contact: david.hughes02@ntu.ac.uk for informal discussions.

13.
DEVELOPMENT OF COLISTIN RESISTANCE IN ANTIBIOTIC RESISTANT ENTEROBACTERIACEAE

Enterobacteriaceae are becoming more and more resistant to antibiotics currently in use. This means that often the therapy being recommended requires a “standard” antibiotic coupled with the membrane active Colistin, as in the treatment of carbapenemase producing enterobacteriaceae. Colistin works in a similar way to membrane-active disinfectants and we have generated disinfectant-adapted enterobacteriaceae that show stable high resistance to Colistin and other antibiotics. This takes weeks, compared to the slower adaptation observed for Pseudomonas and Acinetobacter spp. and we have generated resistance to Colistin by adaptation in a similar fashion.

We wish to mimic such therapies against our collection of drug resistant enterobacteriaceae in order to determine if any of these therapies pose a risk in producing possibly untreatable infections in the future.

Bacteria will be exposed to a range of concentrations of the antibiotics combinations described above and passaged for a week. Their MIC and MBC for each antibiotic involved will be determined and the dose increased if resistance is observed.

At each stage bacteria will be frozen down to capture the stage of resistance with mechanisms such as reduced permeability, alterations of cytoplasmic membrane, efflux of antibiotics and increased production of antibacterial enzymes being investigated.

In addition other virulence factors will be examined such as biofilm and capsule production, other antibiotic resistances, serum resistance and ability to invade/adhere to appropriate host cells. Variants will also be investigated at the genome level to look for single nucleotide polymorphisms that might relate to the phenotypic changes that are observed.

Supervisors: Dr. Michael Loughlin

Supervisor biogs

Dr Loughlin has supervised two PhD students one of which is writing up, the second in the middle of studies. Dr Loughlin’s expertise is in disinfectant resistance and has investigated such adaptations in both Pseudomonas (Loughlin et al 2002) and Acinetobacter spp (http://www.medpagetoday.com/MeetingCoverage/ICAAC/41575) showing links between exposure to disinfectants and antibiotic resistance.

The research will be carried out in a containment level 2 laboratory that is fully equipped with all the latest equipment and access to a new genomics facility soon to be opened at NTU. Drs McNally and Loughlin are part of the Pathogen research group and regular research meetings amongst members of the group provide extra support for the students and supervisory team, bringing in extra expertise to support the direction of the projects

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st

Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Microbiology or related discipline.**

Contact: michael.loughlin@ntu.ac.uk for informal discussions.

14.
DISINFECTANT RESISTANCE ACQUIRED BY CAMPYLOBACTER AND ASSOCIATED CHANGES IN VIRULENCE

Campylobacter is the major cause of bacterial foodborne disease worldwide. In England and Wales there were around ~62k reported cases of campylobacteriosis which is thought to represent an under-estimate of around 10-fold. The main reservoir of Campylobacter is poultry and around 70% of poultry bough at retail is contaminated with this organism.

Much effort has gone into trying to remove this organism from the food chain with little success. Increased biosecurity at the broiler house has not been very effective and at the slaughter stage if a bird enters the abattoir Campylobacter-free it is likely be coated in this organism at the end of the processing line. We know that some types of Campylobacter re-occur in the poultry processing plant and within the broiler house despite a thorough cleaning regime and it is likely that these types are better able to survive the processing plant and may well have resistance to the disinfectants used.

This project will investigate the ability of Campylobacter to resist disinfectants that are used within the broiler house and processing plants. Variants of Campylobacter with resistance to these chemicals will be generated through repeated passage in sub-lethal concentrations of disinfectants. The stress survival ability and the role of biofilm formation in this resistance will be investigated along with the subsequent effect on virulence potential. Variants will also be investigated at the genome level to look for single nucleotide polymorphisms that might relate to the phenotypic changes that are observed.

Supervisors: Dr. Georgina Manning

Supervisor biogs

The supervisory team will consist of Dr Georgina Manning as Director of Studies and Dr Michael Loughlin as second supervisor.

Dr Manning has just under twenty years of experience of working with Campylobacter both at NTU and formerly at the Veterinary Laboratories Agency. Dr Manning has supervised six PhD students to completion as Director of Studies and several more as second supervisor.

The research will be carried out in a containment level 2 laboratory that is fully equipped with all the latest equipment and access to a new genomics facility soon to be opened at NTU. Drs Manning and Loughlin are part of the Pathogen research group and regular research meetings amongst members of the group provide extra support for the students and supervisory team, bringing in extra expertise to support the direction of the projects

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st

Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Microbiology or related discipline.**

Contact: georgina.manning@ntu.ac.uk for informal discussions.

15.
INVESTIGATION OF PATHOGENESIS OF CAMPYLOBACTER JEJUNI

Campylobacter jejuni is a major cause of human gastroenteritis worldwide. C. jejuni is a foodborne pathogen and contaminated poultry is a major source of human infections. Symptoms include fever, abdominal cramps and diarrhoea which is often bloody with the presence of blood and mucus indicating that this organism is able to invade the intestinal epithelium. Efforts to remove C. jejuni from the food chain have been largely unsuccessful to date.

In common with other bacteria, C. jejuni constitutively produces outer membrane vesicles (OMV). OMV have significant roles in stress survival and disease pathogenesis across many bacterial species. C. jejuni OMV deliver active cytolethal distending toxin to human intestinal epithelial cells, inducing cytotoxicity and inflammatory responses, and may promote bacterial invasion across the intestinal epithelial barrier (Elmi et al 2015).

Previous research in our laboratory has identified a number of strains of C. jejuni that are able to invade intestinal epithelial cells to a high level (Fearnley et al., 2008). The proposed project will compare the production and contents of OMV from normal and hyperinvasive strains, and determine whether OMV play a role in hyperinvasion. In addition, genes involved in OMV production will be identified using our existing transposon mutant library.

References

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Supervisors: Dr. Georgina Manning

Supervisor biogs

The supervisory team will consist of Dr Georgina Manning as Director of Studies and Dr Jody Winter as second supervisor. Dr Manning has just under twenty years of experience of working with Campylobacter both at NTU and formerly at the Veterinary Laboratories Agency. Dr Manning has supervised six PhD students to completion as Director of Studies and several more as second supervisor. Dr Winter is a molecular microbiologist with expertise in bacterial virulence and host-pathogen interactions and a particular interest in the roles of OMV in bacterial pathogenicity (Winter et al 2014). The research will be carried out in a fully equipped containment level 2 laboratory with access to the recently opened genomics and proteomics facilities at NTU.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Microbiology or related subject**

Contact: georgina.manning@ntu.ac.uk for informal discussions.

16.
ROLE OF MICROTUBULES IN CHRONIC MYELOID LEUKAEMIA RESISTANCE

Chronic myeloid leukaemia (CML) is one of the leukaemias with better prognosis due to the efficiency of the commercial drug imatinib. However, sometimes patients develop a resistance to imatinib treatment and the disease will evolve from a chronic phase to a blast phase with poorer prognosis. In these cases, alternative therapies are urgently required.

During the blast phase of the disease, chromosomal instability is developed. Chromosome segregation during cell division can be affected by de-regulation of tubulins and by centrosome defects. BCR-ABL1 activity (being this protein the fused protein arisen after the chromosomal translocation that occurs in 95% of CML patients) has been linked to abnormal centrosome activity and our research suggests beta-tubulin expression varies during CML blast and chronic phases. This study will therefore focus in the role of BCR-ABL1 in beta-tubulin expression and centrosome regulation during CML progression.

This project will make use of molecular biology techniques (RNA extraction and real-time PCR) and fluorescence microscopy to try to find suitable alternative targets in resistant cell lines.

References

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Supervisor: Dr. Cristina Montiel-Duarte

Supervisor biogs

Dr Montiel-Duarte is a Licentiate (BSc + MSc) in Biochemistry, a Licentiate (BSc + MSc) in Biology, and has a PhD in Biochemistry. She became a permanent lecturer at NTU in September 2011 and her research is focused in understanding gene regulation and de-regulated signalling pathways in cancer. She has successfully completed the supervision of her first PhD student and has a second PhD student in collaboration with the University of Navarra (in Spain).

Her research involves national and international collaborators and was part of the REF submission: deemed to be internationally excellent in terms of originality, significance and rigour.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biochemistry / Molecular Biology or related discipline.**

Contact: cristina.montielduarte@ntu.ac.uk for informal discussions.

17.
A POSSIBLE LONG NON-CODING RNA AS A BIOMARKER FOR PROSTATE CANCER

Our understanding of gene regulation was dramatically changed with the appearance of next generation sequencing and we are still trying to come to terms with the fact that RNA molecules might have a greater role in gene expression regulation than initially thought. One of such molecules are 'long non-coding RNAs' or lncRNAs. These RNAs seem to be highly tissue-specific and some of them have been proposed as biomarkers for different cancers.

One of the cancers that would benefit from clearer diagnostic tests is prostate cancer. We have preliminary data supporting the expression of a long non-coding RNA only in prostate cancer cell lines. The aim of this project would be to test the validity of this lncRNA as a biomarker for prostate cancer and to understand its role in the cell. The project will involve the use of hybridisation techniques in cells and tissues to study the expression of this lncRNA in patient samples versus control individuals and knock-down experiments to understand its role in a subset of prostate cancer cell lines.

References

- Veltri, WR. (2014) Non-coding RNAs as biomarkers for metastatic prostate cancer. The Lancet Oncology, 15 (13): 1412-1413.

Supervisors: Dr. Cristina Montiel-Duarte

Supervisor biogs

Dr Montiel-Duarte is a Licentiate (BSc + MSc) in Biochemistry, a Licentiate (BSc + MSc) in Biology, and has a PhD in Biochemistry. She became a permanent lecturer at NTU in September 2011 and her research is focused in understanding gene regulation and de-regulated signalling pathways in cancer. She has successfully completed the supervision of her first PhD student and has a second PhD student in collaboration with the University of Navarra (in Spain).

Her research involves national and international collaborators and was part of the REF submission: deemed to be internationally excellent in terms of originality, significance and rigour.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biochemistry / Molecular Biology or related discipline.**

Contact: cristina.montielduarte@ntu.ac.uk for informal discussions.

18.
THE IMPACT OF INFLAMMATION ON G PROTEIN-COUPLED RECEPTOR REGULATION IN HUMAN AIRWAY EPITHELIAL CELLS

Airway epithelial cells play a central role in the development and progression of asthma, an inflammatory airway disease. In common with most cell types, they express a multitude of G protein-coupled receptors (GPCRs), which respond to a variety of extracellular stimuli and influence key epithelial cell functions, such as mucus secretion and cilia beat frequency. However, surprisingly little is known about how these GPCRs (including β2-adrenoceptors, as well as receptors for ATP, adenosine, endothelin-1 and histamine) are regulated in human airway epithelial cells and how this regulation may be altered by a pro-inflammatory environment, such as would be found in an asthmatic airway. This project would initially characterize the signaling and regulation (desensitization, re-sensitisation and internalization) of these GPCRs (using second messenger signalling assays for cyclic AMP, Ca2+ and MAP kinase pathways) in primary human bronchial epithelial cells and a bronchial epithelial cell line (BEAS2B-R1). We would then investigate how GPCR regulation is altered under pro-inflammatory conditions (by examining the effect of culturing cells in the presence of a cocktail of inflammatory cytokines) and investigate the mechanism(s) behind this, by measuring levels of expression of key mediators of GPCR regulation (e.g. GPCR kinases (GRKs) and arrestin proteins), by qPCR and western blotting. The supervisory team for this project has extensive experience in the field of GPCR signalling and regulation1-6, as well as in airway cell biology7,8. This project provides an excellent opportunity to apply this expertise to the question of the role of altered GPCR regulation in inflammatory airway disease.

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- *Hodge E, *Nelson CP, *Miller S, et al. (2013) Respiratory Research. 14: 77.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Pharmacology or related discipline.**

Contact: carl.nelson@ntu.ac.uk for informal discussions.

19.
UNDERSTANDING THE EFFECTS OF HIGH GLUCOSE ON TROPHOBLAST CELL BEHAVIOUR, PROLIFERATION AND INVASION

Trophoblast invasion which occurs in early pregnancy is tightly controlled by several factors including insulin, vascular endothelial growth factor (VGEF), insulin like growth factors (IGF) etc. Moreover, maternal hyperglycemia hinders the trophoblast invasion by inducing stress signaling pathways. Despite the strong link between hyperglycemia and reduced trophoblast invasion, it is impossible to study the status of the intra-cellular pathways in hyperglycemic pregnancies in vivo. Due to this ethical constraint, several investigators attempted using in vitro trophoblast cell lines to study the pathways affected by hyperglycemia. However there are no conclusive agreement amongst these studies as their results were influenced by individual methodologies used. We are successfully using different transformed first trimester trophoblast/tumour-lineage placental cell lines as models of placental invasion. Therefore we aim to understand the effects of hyperglycemia on physiological functions of trophoblast cells by studying the status of intra-cellular pathways involved in proliferation/invasion in all different trophoblast cell lines.

The project will first study the effects of mild and severe hyperglycemia on proliferation and invasion of these cells using established invasion assays. Then focus on the factors that are involved in (a) stress signaling pathways such as MAPkinase, urokinase plasminogen activator, plasminogen activator inhibitor; and (b) anti-angiogenic/inflammatory mediators such as placental growth factor VEGF and IGF. The mRNA and protein of these pathway specific proteins will be analyzed using conventional as well as microarray technologies. The study will show the pathway specific changes that are induced by different levels of hyperglycemia and how this affects trophoblast invasion.

Supervisors: Dr. Shiva Sivasubramaniam

Supervisor biogs

Both supervisors have established research laboratories within NTU and have been supervising PhD projects. Between themselves they have more than eight active researchers/PhD students.

SDS have been working in the field of placental pathologies especially pre-eclampsia. He is also a member of International Federation of Placenta association and a regular contributor to its annual conferences. He has established collaborations with Medical university of Graz, Austria and Anthony Nolan Cord Cell Therapy Centre, UK. He currently running PhD projects funded by the Saudi Arabian Ministry of Higher Education and NTU focusing the trophoblast invasion and its similarities to tumorigenesis. He is also an invited reviewer for scientific journals such as Placenta, American Journal of Physiology and Journal of Perinatal Medicine.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st

Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **biomedical sciences or related discipline.**

Contact: shiva.sivasubramaniam@ntu.ac.uk for informal discussions.

20.
ESTABLISHMENT AND CHARACTERIZATION OF STEM-LIKE CELLS FROM HUMAN TROPHOBLAST AND CHORIOCARCINOMA

Early trophoblast cells and tumour cells are both highly invasive, as they contain a sub-population of “stem like cells” (SLCs). These SLCs can proliferate to form a heterogeneous cell group. However, the invasion of trophoblast SLCs is transient and highly regulated. Although several studies have attempted to compare the invasive processes of trophoblast and tumour cells, comparative data on the behaviour of these different SLCs is limited. This study will compare the status/expression of genes and factors that modulate the invasion in SLCs derived from trophoblast and tumour cell lines. It is hypothesised that the status of the common invasion specific genes, mRNAs and/or proteins can be identified by comparing their expression during the biological events associated with respective SLCs.

The study will first isolate different types of SLCs from transformed human first trimester early trophoblast and choriocarcinoma cell lines. Upon confirmation of their “stemness”, computational analysis and proteomic data will be used to identify genes/proteins that are up-/down-regulated in SLCs. The physiological behaviour of SLCs will be compared with respective parental cells using invasion assays under normoxic/hypoxic conditions. This study would elucidate the important factors that regulate the invasive process of SLCs in transformed trophoblast and choriocarcinoma cells. It would show the influence of hypoxia, a favourable environment for tumour and trophoblast invasion, on the expression of these factors and therefore their importance in the invasive process. Overall the study would develop an in vitro model suitable to comparatively analyse the molecules involved in physiological and pathological invasive processes.

Supervisors: Dr. Shiva Sivasubramaniam

Supervisor biogs

The supervisory team have established research laboratories. SDS has been working in the field of placental pathologies especially pre-eclampsia. He is also a member of International Federation of Placenta Association and is a regular contributor to its annual conferences. He has established collaborations with Medical University of Graz, Austria and Anthony Nolan Cord Cell Therapy Centre, UK. He is currently undertaking PhD projects funded by the Saudi Arabian Ministry of Higher Education and NTU focusing the trophoblast/tumour invasion. He is also an invited reviewer for scientific journals including Placenta, American Journal of Physiology and Journal of Perinatal Medicine.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **biomedical sciences or related discipline.**

Contact: shiva.sivasubramaniam@ntu.ac.uk for informal discussions.

21.
THE EFFECTS OF ATMOSPHERIC AIR QUALITY AND PARTICLE POLLUTION ON TROPHOBLAST INVASION

It has been suggested that chronic exposure to ambient air pollution during pregnancy might affect placental development and function, leading to pregnancy complications such as pre-eclampsia and intra-uterine growth retardation. These materno-foetal complications are suggested to have resulted by impaired trophoblast invasion. Due to ethical/practical constraints it is extremely difficult the study the effects of these pollutants in vivo. Therefore it is important to use in vitro models to investigate the effects of air quality on early trophoblast invasion and monitor the changes in the various markers of angiogenesis and Vasculogenesis. We have acquired two transformed first trimester trophoblast cell lines namely HTR8svneo and TEV1. These cell lines have successfully been used in cell invasion studies.

The aim of the proposed study is to investigate the effects of ambient air pollution on the trophoblast invasion mechanisms and the changes in factors that are involved in early placental development. The study will mainly focus on the air quality and particle pollution. Initially, using data base searches the air quality of different cities including the most polluted cities around the world (eg. Beijing, Delhi, Mumbai etc.) will be acquired and the concentration (or percentage) gas/particle pollution will be established. The cell culture media will be prepared with different concentrations of these pollutants (mimicking the respective environment).Using these culture media the study will focus on (a) the cytotoxic/cell proliferative effects of these pollutants on transformed trophoblast cell and (b) the effects of these pollutants on trophoblast migration/invasion and elucidate the changes in the global expression profiles of factors/protein that are up-/down-regulated in trophoblast cells.

The study is expected to reveal the effects of environmental gases and particulate pollution on the invasive potentials of first trimester extravillous trophoblast cells.

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- Reduced placental vascular reactivity to 5-hydroxytryptamine in pre-eclampsia and the status of 5HT2A receptors. Ugun-Klusek A, Tamang A, Loughna P, Billett E, Buckley G and Sivasubramaniam S, Vascular Pharmacology, 2011, 55 (5-6), 157-162
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Supervisors: Dr. Shiva Das Sivasubramaniam

Supervisor biogs

Dr Sivasubramaniam's main research interest is to investigate the underlying concept of molecular events that are associated with trophoblast invasion as a model of tumour invasiveness. His laboratory focuses on the role of invasion specific novel factors such as cancer-testis antigens and onco-foetal proteins during placental invasion. His laboratory has produced two successful PhD completions; two submissions pending viva; currently he is supervising two PhD students. He is also a member of International Federation of Placenta association (IFPA)

Dr Nelson over 15 years' experience in contemporary bioscience techniques, including primary cell culture, ELISA, quantitative PCR, cell migration and proliferation assays, 2nd messenger signalling assays, fluorescent Ca2+ imaging, confocal microscopy and FRET imaging. His current research interests are focussed upon the effects of chronic long-acting β2-adrenoceptor agonists on the bronchial epithelial transcriptome and proteome

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biomedical science, Pharmacology or Molecular Biology.**

Contact: shiva.sivasubramaniam@ntu.ac.uk for informal discussions.

22.
THE EFFECTS OF BIOFLAVONOIDS IN REDUCING PLACENTAL OXIDATIVE STRESS AND TROPHOBLAST APOPTOSIS

The beneficial effects naturally occurring biologically active substances are being explored to assess their antioxidant properties. One such group of substances are called bioflavonoid. Although there is much focus on using bioflavonoid to treat cancer, and blood disorders, their potential as an antioxidant to during pregnancy is not looked at. Although pregnant women do consume natural products such as grapes which contain bioflavonoid, it is not possible to assess their beneficial effects during first trimester. Therefore this study aims to investigate the anti-oxidant properties of bioflavonoids using human trophoblast cell lines, and explants obtained from first trimester. The effects of bioflavonoids on cell proliferation/viability will be assessed by LDH, scratch and invasion (BD© Biosciences) assays. Using hypoxia as an inducer of oxidative stress the study will analyse the effects of different bioflavonoids on the expressions of different cellular markers of oxidative stress.

References

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Supervisors: Dr. Shiva Das Sivasubramaniam

Supervisor biogs

Dr Sivasubramaniam's main research interest is to investigate the underlying concept of molecular events that are associated with trophoblast invasion as a model of tumour invasiveness. His laboratory focuses on the role of invasion specific novel factors such as cancer-testis antigens and onco-foetal proteins during placental invasion. He has two successful PhD completions; two submissions pending viva; currently supervising two PhD students.

Dr Dickenson's research interests focus on identifying novel cardioprotective and neuroprotective cell signalling mechanisms that are activated by members of the G-protein coupled receptor superfamily in particularly the adenosine A1 receptor. We are also interested in the cardioprotective mechanisms of flavonoids. These compounds are widely found in fruits, and vegetables. The effects of these compounds are being

explored using cardiomyocytes exposed to oxidative stress with the aim of identifying novel signalling mechanisms.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biomedical science, Pharmacology or Molecular Biology.**

Contact: shiva.sivasubramaniam@ntu.ac.uk for informal discussions.

23.
AQUATIC-TERRESTRIAL INVERTEBRATE COMMUNITY DYNAMICS IN TEMPORARY STREAM ECOSYSTEMS

Temporary stream ecosystems, which experience regular transitions between wet and dry states, are expanding due to climate change and water resource pressures. Invertebrate communities are fundamental to the ecological integrity of temporary streams and are potential biomonitors of ecosystem health. Although ecological research examining temporary streams is increasing, the discipline remains in its infancy, with most work to date restricted to either the aquatic or the terrestrial phase. Despite profound shifts between aquatic and terrestrial faunas, few studies have examined variability in community composition across wet-dry cycles or across systems of contrasting ecological quality.

This project will explore the aquatic and terrestrial invertebrate faunas of temperate-zone temporary streams to characterize community transitions and interactions during full wet-dry cycles. Streams with contrasting habitat characteristics will be selected, including those determined to be of good and poor quality during wet phases. Field experiments will examine the influence of environmental variables, including ecological quality, on wet and dry phase faunas and their biotic interactions. Laboratory analysis including species-level identification will reveal the biodiversity contributions of aquatic and terrestrial invertebrates, as well as the occurrence of temporary-stream specialists. Laboratory experiments will investigate the influence of abiotic conditions on aquatic invertebrate persistence in dry sediments. The project will develop in response to emerging research priorities and will drive the ongoing evolution of research in this young discipline.

With temporary streams becoming an increasingly important feature of our landscape and ecosystem service suite, the results of this project will raise awareness of the importance of these ecosystems in temperate zones and will inform the work of regulatory agencies seeking to monitor temporary river ecosystem health.

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- Stubbington, R., Datry, T. 2013. The macroinvertebrate seedbank promotes community persistence in temporary rivers across climate zones. Freshwater Biology 58: 1202-1220.

Supervisors: Dr. Rachel Stubbington

Supervisor biogs

Dr Rachel Stubbington is a freshwater ecologist with expertise in invertebrate community dynamics in temporary streams. She has recently published papers examining the persistence of freshwater invertebrates in dry streambed sediments, in journals including Freshwater Biology. Dr Adam Bates is an ecologist with expertise spanning riparian and terrestrial ecosystems. He has published several studies investigating the spatial distribution of invertebrates on exposed riverine sediments. Both supervisors have considerable experience in macroinvertebrate field sampling and identification.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Environmental Science / Ecology.**

Contact: rachel.stubbington@ntu.ac.uk for informal discussions.

24.
EVALUATION OF PALLIATIVE INTERVENTIONS IN MODELS OF ISCHEMIC STROKE

Interruption of blood flow associated with ischemic stroke leads to rapid neuronal necrosis in core regions of affected sites. In the surrounding penumbra area, however, neurons may survive depending on the onset of reperfusion. In addition, palliative treatments may offer neuroprotection and minimise the debilitating consequences.

This project will use a combination of in vivo models of ischemic stroke, as well as ex vivo models (hippocampal slice cultures), and molecular methods (qPCR, in situ hybridisation) to evaluate, whether the application of new technologies (i.e. microRNAs and microRNA inhibitors) improves cell survival.

Specifically, the project aims to investigate:

- the transcriptomic alterations of selected genes linked to pathways activated by cellular stress (autophagy, unfolded protein response, etc.), after an ischemic incident, and
- the impact of palliative interventions, using traditional agents (e.g. anti-inflammatory drugs), and microRNAs and microRNA inhibitors, on cell survival in vulnerable brain regions, such as the hippocampus

References

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Supervisor: Dr. Christian Thode

Supervisor biogs

Dr Christian Thode is a Senior Lecturer in Pharmacology. His expertise is in neuroscience, detection and identification of RNAs in vitro and in situ, molecular biology and neurotransmitter systems.

Dr Carl Nelson is a Senior Lecturer in Pharmacology. His expertise is in G Protein-coupled receptors, cardiovascular and respiratory diseases and neuroscience.

Prof Arsenio Fernández-López is a lecturer at the University of León, Spain. His expertise is in neuroscience, cerebral brain ischemia/reperfusion, in vivo and ex vivo ischemia model (i.e. hippocampal sections) and glutamatergic receptors.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **biosciences or related discipline.**

Contact: christian.thode@ntu.ac.uk for informal discussions.

25.
NEUROTRANSMITTER RECEPTOR CHARACTERISATION OF INPUT AND OUTPUTS CONNECTIONS

The cerebral cortex is a highly connected structure and the arrangement of the cortical connections is highly organised. Typically cortical regions are interconnected via topologically and topographically arranged neuronal connections. Understanding how cortical connections are arranged is fundamentally important to understanding how the cerebral cortex functions and has been especially useful for deciphering the function of the visual and somatosensory cortices. Our research group and others have shown that Prefrontal Cortex (PFC) connections display topological ordering of connections and have relatively widespread reciprocal and non-reciprocal connections. In order to understand how information is processed through cortical circuits, we need to understand the neurotransmitter distribution of receptors on both PFC inputs and outputs, as these act to regulate and gate neuronal activity along neurons. The successful applicant will employ neuronal tracer methods alongside immuno-fluorescent methods to microscopically determine the location of receptors on cortical neurons connected to the PFC. The applicant will gain experience in conventional fluorescent and confocal microscopy. The results produced from this project will help us to define how receptor location contributes to modulating and controlling information flow into and within the PFC and how this relates to the wider cognitive functioning of the PFC.

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- Bedwell, S. A., Billett, E. E., Crofts, J. J., MacDonald, D. M. & Tinsley, C. J. The topology of connections between rat prefrontal and temporal cortices. Front. Syst. Neurosci. 9, 80 (2015).

Supervisors: Dr. Christopher Tinsley

Supervisor biogs

Dr Chris J Tinsley will supervise the research project. He has extensive experience in studying the pharmacology, function and anatomy of the cerebral cortex and has published 23 papers on this subject. He has previously supervised one PhD student. Dr Tinsley has received external funding for his research into cortical function and more recently brain tumour models.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **neuroscience, psychology or related subject.**

Contact: chris.tinsley@ntu.ac.uk for informal discussions.

26.
USING NEURONAL STEM CELLS TO PROMOTE BRAIN RE-WIRING: IN VITRO AND IN VIVO STUDIES

Many neurological disorders, such as Alzheimer's disease and Schizophrenia, have been associated with deficits in cortical connections. Cortical connections are vital for supporting a range of important cortical functions such as cognition. Therefore, when there is damage to neuronal connections during the progression of neurological disease we see subsequent functional impairments. The aim of this project is to exploit recent advances in stem cell and biomaterial technologies to develop experimental approaches to altering connections within neural networks and tissue. Initially this will be performed via in vitro studies with the latter aim of producing changes in brain connectivity in rodent in vivo models. The ultimate goal is to develop this technology to (1) explore the functional consequences of neuronal re-wiring and (2) evaluate how this approach can be used in potential therapies for brain repair.

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Supervisors: Dr. Christopher Tinsley

Supervisor biogs

Dr Chris J Tinsley will supervise the research project. He has extensive experience in studying the pharmacology, function and anatomy of the cerebral cortex and has published 23 papers on this subject. He has previously supervised one PhD student. Dr Tinsley has received external funding for his research into cortical function and more recently brain tumour models.

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Neuroscience, Pharmacology or a related subject.**

Contact chris.tinsley@ntu.ac.uk for informal discussions.

27.
PROTECTING PANCREATIC B-CELL FUNCTION IN TYPE 2 DIABETES

Hyperglycaemia and hyperlipidaemia together contribute to the gradual loss of beta-cell function observed in patients with type 2 diabetes mellitus (T2D). In addition to the failure of compensatory hypersecretion to overcome insulin resistance, reduction in beta-cell mass through increased apoptosis and defective beta-cell regeneration is a key component of T2D. This project will investigate how increased/chronic glucose and fatty acid levels affect pancreatic β-cell function through modulation of genes linked to biological oxidation. In addition, this project will seek to identify molecular mechanisms that moderate this. This will include an assessment of the role of mitochondrial dysfunction and whether nutritional supplements, such as antioxidants, can protect against glucotoxicity and / or lipotoxicty, and thereby prevent diabetes pathology.

Supervisors: Dr. Mark Turner

Supervisor biogs

his project fits within an integrated programme of ongoing diabetes prevention and drug discovery projects at Nottingham Trent University that are under the leadership of Dr. Mark Turner, Associate Professor in Biomedical Molecular Biosciences. Expertise in nutrition will be provided by the co-supervisor Dr. Craig Sale, Professor in Applied Physiology. Expertise in biological oxidation and mitochondrial dysfunction will be provided by the co-supervisor Dr. Luigi De Girolamo, Senior Lecturer in Molecular Biology.

Between them the supervisors have supervised >20 students to successful PhD award. The supervisory team also have a track record of successful grant capture from numerous external funding bodies (e.g. Diabetes UK, NovoNordisk UK Research Foundation, The Royal Society, English Institute of Sport, Ministry of Defence, Natural Alternatives International) and regularly publish in leading international biomedical journals.

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in bioscience or biomedical discipline.

Contact: mark.turner@ntu.ac.uk for informal discussions.

28.
NOVEL BIOMARKERS IN BREAST CANCER

Aberrant expression of transglutaminase-2 (TG2) has been linked with epithelial-to-mesenchymal-transition and acquisition of cancer-stem-cell phenotype, responsible for metastasis/resistance of ovarian and breast cancer cells. One specific goal of this project is to evaluate transglutaminase-2 (TG2) as diagnostic/prognostic marker. In particular the role played by extracellular TG2 in outside-in signalling events leading to breast cancer progression will be investigated, with an emphasis on dissecting the pathway(s) whereby extracellular TG2 activates transforming growth factor beta1 (TGFbeta1). The hypothesis that heparan sulphate proteoglycans like Syndecan-4 may act in synergy with TG2 in TGFbeta1 activation will be investigated. Furthermore, the role played by TG2-alternative transcripts in TGFbeta1 activation and their link with cancer progression will be explored. An aspect of the project may entail studying the possible link between TG2 and the aggressive oestrogen-insensitive phenotype, investigating the expression of TG2 transcripts in breast cancer biopsies.

Supervisors: Dr. Elisabetta Edwards

Supervisor biogs

The project will be carried out collaboratively between groups with long-standing expertise in the molecular cell biology of Transglutaminase 2 (Dr. Verderio from the Biomedical, Life and Health Science Research Centre at NTU) and tumour biology (Dr McArdle and Prof Ball, based at The John van Geest-Cancer Research Centre (JvG-CRC) at NTU). The two groups are already working together on a different cancer-related project.

Research on Transglutaminase has a long-standing tradition of excellence at NTU. Dr Verderio, one of the leaders, has received funding as PI by the Wellcome Trust, KRUK, iNET in the past years, and contributed to REF (UoA-A03) with 4 papers. The impact on research of Prof G Ball and Dr McArdle, based at the John Van Geest Cancer Research Centre, is tangible, with state of the arts facilities, a large network of international collaborators and an ambitious research programme, likely to lead to beneficial outcomes to therapy.

Entry Requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biomedical Sciences, Biochemistry, Biology or related discipline.**

Contact: elisabetta.verderio-edwards@ntu.ac.uk for informal discussions.

29.
DEVELOPMENT OF SELECTIVE PHOTOTHERAPY TREATMENT FOR BREAST CANCER

This project will investigate a breast cancer treatment specific for Her2 positive-breast cancer cells, by using nanoparticles. Her2 is a mutant form of the epidermal growth factor receptor, a powerful stimulator of cell proliferation, often mutated in cancer leading to uncontrolled cell growth and invasion. TiO2 nanoparticles are phototoxic towards mammalian cells since UV light induces reactive oxygen species formation (ROS) that trigger programmed cell death (apoptosis). Here the photo-toxicity of TiO2 will be exploited as a possible new form of cancer therapy.

Nanoparticles have the propensity to accumulate randomly in tumour cells. To overcome passive cellular distribution, specific targeting could be achieved very specifically by using particles of TiO2 tethered to a cancer cell-specific antibody. A similar approach was used by others to target IL13alphaR for the treatment of glioma (Rozhkova et al 2009 in Nano Lett 9:337-42). The targeting of Her2 positive breast cancer cells will be achieved in this project by covalently linking Herceptin, a well described monoclonal antibody towards Her2 (already used in therapy), to TiO2 nanoparticles. DOPA will be used as a linker. Her2 positive cell lines expressing various levels of Her2 are available to us and will be employed as a breast cancer cell model. Apoptosis induced by photo-stimulated Herceptin-functionalised TiO2 nanoparticles will be monitored by a range of specific assays already set up in our laboratory, including Caspase 3 activation and nuclear degradation.

The project offers a multidisciplinary approach to the development of functional inorganic nanomaterials for pharmaceutical and biomedical applications and suits a student with an interest in pharmacology, cell biology and material chemistry.

Supervisors: Dr. Elisabetta Verderio

Supervisor biogs

Dr Elisabetta Verderio Edwards is a reader/associate professor in Medical Biochemistry at NTU and a registered Pharmacist. During her career she has received funding from research councils and charities including the Wellcome Trust and the EPSRC. She has authored over 30 research articles (average IF ~ 6) in the area of molecular basis of disease, extracellular matrix/biomaterials, renal disease and cancer biology, leading to successful completion a number of PhD students.

Dr Valeria Puddu is a chemistry lecturer at NTU. Her expertise lies in the fields of material chemistry with specific interest in the development of photocatalytic materials; and interactions at the bio – inorganic interface. She has also presented or co-authored over 20 conferences proceedings of specialized materials and photocatalysis meetings including two Keynote talks (EuroBioMat 2011, AOT-15 2009).

Entry requirements

In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st

Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Biochemistry or Chemistry or related subject.**

Contact: elisabetta.verderio-edwards@ntu.ac.uk for informal discussions.

30.
THE BACTERIOPHAGES OF HELICOBACTER PYLORI

H. pylori is a Gram negative microaerophilic bacterium which infects the stomachs of around half of the world's population. Infection persists lifelong, inducing chronic inflammation of the stomach lining (gastritis), which may progress to ulceration and cancer. Gastric cancer is the third biggest cause of cancer deaths worldwide. An infected individual's risk of severe H. pylori-induced disease depends on host and environmental factors and on the virulence of the infecting strain.

H. pylori is highly polymorphic, and able to adapt rapidly to its niche. Microevolution within a single host is seen and strains can readily exchange DNA. Although eradication of H. pylori heals ulcers and reduces gastric cancer risk, antibiotic resistance is increasingly common and first line eradication therapy now fails in more than 20% of cases.

With the emergence and spread of extensively antibiotic resistant bacteria, there is renewed interest in the possible use of bacteriophages in the treatment of bacterial infections. Little is currently known about the bacteriophages of H. pylori. This project will identify, isolate and characterise phages from H. pylori strains using a combination of bioinformatics and wet laboratory approaches.

References

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- Mégraud, Therap Adv Gastroenterol, 2012, 5 (2): 103-109
- Reardon, Nature, 2014, 510: 15-16

Supervisors: Dr. Jody Winter

Supervisor biogs

Dr Jody Winter: Dr Winter is a molecular microbiologist with expertise in bacterial virulence and host-pathogen interactions. She has recently published papers on H. pylori virulence and host interactions in the Journal of Infectious Diseases and in Infection and Immunity.

Dr Dickins studies variation in small (including bacteriophage) genomes and has experience in the analysis of variation and evolutionary trajectories using next-generation sequencing data. In 2014-15 he has published in a variety of journals including Proceedings of the National Academy of Sciences USA (PNAS).

Entry requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or UK equivalent according to NARIC) with a minimum of a merit, and/or a UK 1st Class/2.1 Bachelor's degree (or UK equivalent according to NARIC) in **Microbiology or related subject.**

Contact: jody.winter@ntu.ac.uk for informal discussions.