**CALL FOR BBSRC EASTBIO DTP PHD PROJECT PROPOSALS**

The Universities of Edinburgh, Aberdeen, Dundee and St Andrews are partners in the BBSRC East of Scotland Doctoral Training Partnership ([EASTBIO](http://www.eastscotbiodtp.ac.uk/)).

The EASTBIO PhD programme will award a minimum of 29 4-year PhD studentships and 5 4-year industrial CASE studentships across the partner universities with a start date of October 2016. The studentships cover fees, stipend, research training support costs of £5,000 per year (this is reduced to £2,000 in the final year) and a small travel and conference allowance for each student. Students are required to undertake enhanced subject-specific, core bioscience and generic skills training and a 3-month professional internship (PIPS) outwith academia.

**In proposing a project, the supervisors are committing to actively support their student’s development as outlined above. They are also committing to attend the EASTBIO induction and annual symposia as well as participate in the provision of training in the BBSRC strategic priority area (thematic group training) to which their student’s project is aligned.**

Eligible staff\* in each of the partner Institutions are invited to submit a project proposal using the headings on pages 3 and 4 to **pgrecbiology@st-andrews.ac.uk by 16 October, 2015.**

**\* For queries on eligibility please contact the administrator in your institution (see** [**www.eastscotbiodtp.ac.uk**](http://www.eastscotbiodtp.ac.uk) **for details)**

**Supervisors may not lead an EASTBIO studentship project in two consecutive years.**

The projects will be approved by the EASTBIO Management Group prior to advertisement based on fit to the [BBSRC remit](http://www.bbsrc.ac.uk/research/science-remit.aspx) and the criteria outlined below.

**The project proposals must fulfil more than TWO of the following criteria**:

* Align to one of the 4 BBSRC strategic priority areas: Agriculture and food security, Industrial biotechnology and bioenergy, Bioscience for health and World-class research underpinning bioscience. <http://www.bbsrc.ac.uk/funding/priorities/priorities-index.aspx>

<http://www.bbsrc.ac.uk/publications/planning/strategy/strategic-plan-index.aspx>

* Exploit new ways of working as defined by the BBSRC:

<http://www.bbsrc.ac.uk/funding/priorities/priorities-index.aspx>

* Be interdisciplinary, perhaps drawing a second supervisor’s expertise from another School in the College/University
* Develop collaborations through cross-supervision with other EASTBIO partners/associate partners. (Partners are Universities of Edinburgh, Aberdeen, Dundee and St Andrews; associate partners are The James Hutton Institute and SRUC)
* Develop collaborations with an industrial partner (CASE studentship). For more information see: <http://www.bbsrc.ac.uk/documents/case-information-pack-pdf/>
* Provide match-funding (i.e. half-studentship) from other sources including grants, matched funding from associate partners, local organizations and innovation centres, such as IBioIC.

**Further details of the recruitment process will be forwarded in due course to all potential supervisors who have a project advertised on the EASTBIO web site and FindAPhD.**

**GUIDANCE *- In vivo* skills awards**

The ***in vivo* skills awards** provide additional funding to cover the costs of **advanced** ***in vivo* research training** for BBSRC-funded PhD students. The awards are intended to encourage supervisors, who might otherwise be put off by the cost, to consider student projects involving a substantial *in vivo* research training component.

The awards provide **additional** funding towards the high costs of training and do not replace the normal studentship funding from training grants. Funding provided to successful applicants will be at the level of **£20,000 per project** in which advanced *in vivo* training is undertaken. Standard studentship costs (i.e. student stipend, fees, etc.) should be drawn from the DTP as normal.

BBSRC defines **advanced *in vivo* skills training** as research skills where **a major component of the work** involves:

* developing and applying sophisticated physiological, immunological, pharmacological, behavioural observation
* experimentation in whole, living protected animals (as defined in the Animals (Scientific Procedures Act 1986) in order to understand normal and abnormal biological/ psychological mechanisms.

Research projects must provide significant hands-on training, including (but not limited to):

* surgical and pre-clinical skills,
* complex experiments, novel imaging technologies and/or other innovative techniques.

Research training which is predominantly focused on **the generation of transgenic lines; model systems lacking clear novelty; or the use of animals primarily as sources of DNA, cells, tissues or biological fluids, are NOT included** in the priority area.

**PLEASE SUBMIT A WORD DOCUMENT WITH HEADINGS AS FOLLOWS:**

***All fields must be completed.***

Understanding the role of leptin in the ageing nervous system

**Supervisor 1** Dr Gayle H Doherty

Institution and School: School of Psychology and Neuroscience, University of St Andrews

Lab web site url: <https://risweb.st-andrews.ac.uk/portal/en/persons/gayle-helane-doherty(ec981419-7f32-4223-a638-311fdbe7532a).html>

Current PhD students and year of study: Lisa Strother, 3rd Year; Alison Holiday, 2nd Year; Mizuki Morisaki arriving in April 2016.

**Supervisor 2** Dr Jenni Harvey

Institution and School: Division of Neuroscience, University of Dundee

Lab web site url: <http://medicine.dundee.ac.uk/staff-member/dr-jenni-harvey>

Current PhD students and year of study: : Yasaman Malekizadeh, 3rd year; Gemma McGregor, 2nd year, James Foster, 1st year, Adham Farah arriving November 2015.

**Project description**:

Please provide in no more than a page (max. 700 words, and up to 3 references) a description of the PhD project, which includes information about the project and the research training it will provide.

As we age, the body undergoes a number of changes that can impact upon our ability to stay active and interactive. This project will focus on age-related change in the nervous system and consider the role of a particular neuroactive hormone, namely leptin. Changes in hormonal activity with age have been well-studied and have, by and large, focused on the steroid hormones such as estrogen and testosterone. However, it is well known that peptide hormones also play a number of important roles in the nervous system, which suggest that impairments in their levels and/or signalling pathways could contribute to ageing.

The hormone leptin was first discovered due to its anti-obesity actions and thereafter has proven to have multiple roles in the developing and mature nervous system. It is known that ageing can modulate the levels of both leptin and the leptin receptor, as well as decreasing sensitivity to leptin. However, there is no detailed knowledge of the consequences of this for neuronal wellbeing. This project asks: what is the role of leptin in the ageing mammalian brain?

To address this question, the successful candidate will be trained in a range of neuroscience techniques from cell biology and molecular biology to electrophysiology. A full biochemical analysis of leptin levels and leptin signalling pathways will be undertaken in young and aged rodents. This will be coupled to *in vitro* experiments on young and aged neurons and glia to determine their response to leptin signalling and determine how sensitivity changes with age. As part of this aim we will develop novel techniques to grow neurons and glia over extended periods of time in vitro until they develop age-linked biomarkers (accumulation of oxidative damage for neurons and, in addition, for glia we will look for markers of senescence). These studies will develop new tools for studying ageing in the nervous system. We will investigate whether leptin modulates the rate of accumulation of age-linked biomarkers such as oxidative modifications to protein, lipids and DNA, and rates of senescence (glia). We will also focus on mitochondrial changes associated with ageing and determine whether leptin plays a role in mitochondrial wellbeing in neurons and glia.

Building on this we will consider the electrophysiological response of neuronal slices derived from different ages of animals to exogenous leptin administration. Our previous studies indicate that leptin has powerful cognitive enhancing properties as it facilitates the cellular events underling hippocampal learning and memory (Doherty et al., 2013). Indeed, acute application of leptin results in rapid alterations in hippocampal dendritic morphology, glutamate receptor trafficking and synaptic plasticity. Our recent studies indicate that the ability of leptin to induce LTP at hippocampal CA1 synapses is markedly attenuated with age (Moult and Harvey, 2011). However the cellular mechanisms underlying this reduced sensitivity to leptin are not clear. Here we propose to examine in detail how the ability of leptin to regulate AMPA receptor trafficking and dendritic morphology is altered with age. As the direct (temporoammonic; TA) input from the entorhinal cortex to hippocampal CA1 synapses is also regulated by leptin, we will also explore how leptin regulation of TA-CA1 synapses alters during ageing.

In concert with these studies we will consider rodents that lack leptin/ leptin receptor signalling and determine whether leptin deficiency or insensitivity can exacerbate or accelerate age-related changes in neuronal wellbeing, electrophysiology and behaviour.

The project offers an excellent training opportunity in a range of neurobiology techniques, fostering links across two EASTBio partners. This multi-faceted approach to investigating leptin’s role in the ageing brain will reveal new insights into the role of this hormone in aged animals.

**References**

Doherty GH, Beccano-Kelly D, Yan SD, Gunn-Moore FJ, Harvey J. Leptin prevents

hippocampal synaptic disruption and neuronal cell death induced by amyloid β.

Neurobiol Aging. 2013 Jan;34(1):226-37.

Moult PR, Harvey J. NMDA receptor subunit composition determines the polarity

of leptin-induced synaptic plasticity. Neuropharmacology. 2011 Oct-Nov;61(5-6):924-36.

Doherty GH. Obesity and the ageing brain: could leptin play a role in

neurodegeneration? Curr Gerontol Geriatr Res. 2011;2011:708154.

Please explain in no more than half a page how your project is relevant to the BBSRC remit and strategic priorities (see call text for details and links, taking care to read the remit descriptions in detail):

This project aims to elucidate the potential for the hormone leptin to modulate the mechanisms underlying normal healthy ageing in rodent model species and as such will provide data that will be highly relevant to understanding the ageing process, a key research priority. The application of data taken from the molecular through to organismal scale is also a central component of this work, again allied with several key areas highlighted within this priority. A better understanding of the role of this metabolic hormone in ageing could inform housing and enrichment choices, and therefore this work could also inform research areas that lie within the Animal Health and Welfare priorities. The established role of leptin in energy balance aligns with the research priority of a greater awareness of the roles of nutrition and physical activity and the mechanisms by which they affect development and health. The leptin deficient/ insensitive animals proposed for study in this project have imbalances in energy intake and expenditure that can inform on the benefits of physical activity and nutrition not only in development and health but also in ageing. This forms a bridge between the BBRSC research goals in understanding ageing and the impact of nutrition and physical activity on physiology.

Please delete as appropriate to indicate which **one area of the BBSRC remit** your project relates most closely to:

**Bioscience for health**

Please delete as appropriate to indicate any of the BBSRC **new ways of working** which will be exploited by your project:

**New tools and facilities**

**Is this a cross-institutional collaborative project?**

**YES**

If the project involves cross-supervision with other EASTBIO partners/associate partners please explain (up to 200 words) the specific roles of each supervisor and give details of the research training they will provide (please include an indication of what time the student will spend at each institution).

This is a cross-institutional project between St Andrews and Dundee Universities. The student would spend approximately half of their time in each institute. GHD will oversee all biochemical and cell biological studies. Full training in electrophysiology will be obtained in the laboratory of JH. All supervisors will be involved in assisting in project management and ensuring that the student receives the adequate training and support to complete the PhD.

**Is this an interdisciplinary project?**

**NO**

If the answer is YES, please provide additional details (up to 200 words).

**Are any sources of matched funding available for this project?**

**NO**

If the answer is YES, please indicate the level of contribution.

**Does the project involve a significant *in vivo* skills training component?**

**NO** please delete as appropriate

If the answer is YES, please provide additional details, including the species and the techniques that will be used as well as whether there is an ethical approval in place to carry out the project. Please note that projects that include a substantial *in vivo* skills training component (see *in vivo* skills guidance) could be eligible for enhanced financial support of additional £5,000 per year.

**Is this an industrial CASE studentship project?**

**NO**

If the answer is YES, please provide **a** **formal** **letter from the industrial partner** that includes the following:

1. Financial commitments from the company as well as any other in-kind contribution towards the project. Note that the minimum financial contribution to the academic institution by companies with more than 50 employees is £1,400 per year.

2. Commitment to support a 3-month placement including associated costs (travel, accommodation and training of the student).

3. Whether an IP agreement has or will be signed with the host university.

4. Whether publication arrangements have been agreed.