Vacation Scholarships 2015

Sixty seven applications were submitted and 48 offers of award were accepted.

Jaclyn Carberry & Professor Colin Berry, University of Glasgow
Incidence and pathophysiological significance of persistent myocardial oedema and haemorrhage in the infarct zone of heart attack survivors
Heart attack causes sudden swelling, bruising and damage of the heart. Prompt restoration of blood flow by re-opening the blocked coronary artery and use of cardioprotective medicines improves survival after a heart attack. Since more patients are being treated effectively these days, more people are surviving with injured hearts. Because of the initial heart damage, heart attack survivors are at-risk of future heart failure, which is a debilitating condition. Our group has recently completed one of the largest ever heart attack studies involving state-of-the-art cardiac magnetic resonance imaging (MRI). 300 heart attack survivors had MRI 2 days and 6 months after emergency treatment to open the blocked heart artery. To date we have focused on the early MRI scans. In this Vacation Scholarship, we propose to 1) analyse the 6-month MRI scans for persistent oedema and haemorrhage, and 2) assess the frequency and significance of these pathologies on heart function and clinical outcomes.

Oliver Hsia& Profesor Neil Bullheid, University of Glasgow
Characterising the reduction of methionine sulfoxide in the mammalian endoplasmic reticulum
This project aims to characterize the pathway of repair of methionine residues in proteins present in the secretory pathway to provide a much greater understanding of the role of methionine oxidation during oxidative stress. Oxidative stress can lead to debilitating diseases such as Alzheimer's, Parkinson's and cancer so it is important for us to understand the how cells cope with the damage to proteins caused under stress. One consequence of oxidative stress is the oxidation of proteins at either methionine or cysteine residues. This oxidative damage can be repaired by enzymes that reverse the modification. Our understanding of the repair to cysteine residues is well advanced; however, our understanding of the repair of methionine residues is limited.

Reema-Maria Shinhmar & Professor Marcel Jaspars, University of Aberdeen
Discovery of new antibiotics from the deep oceans
There is an urgent need for new antibiotics to counter increasing resistance to antibiotics globally. No new structural class of antibiotic has been discovered for 30 years. Soil bacteria have given rise to over 70% of currently used antibiotics, but the main hurdle to further exploitation of this resource is repeated rediscovery of known compounds. Our approach is to access extreme environments such as deep ocean trenches to obtain bacterial species new to science to assess their ability to produce new compound classes capable of inhibiting bacterial growth. Our preliminary evidence shows that the discovery of new compounds from deep ocean sediments is much higher than from soil bacteria. The scholar will work as part of a larger directed effort in the research lab to discover novel compounds with antibiotic potential.

Jan Schniete & Dr Johanna Trägårdh, University of Strathclyde
Extending multi-photon imaging beyond the Ti:Sapphire laser wavelength range using a Raman wavelength converter
Imaging is a critical tool for biomedical research. For imaging of live tissue, we need to image as gently as possible, using low powers and longer wavelengths. This is because short wavelengths cause damage to tissue. Longer wavelengths also scatter less away from the intended light path, allowing imaging deeper into tissue. In this project we will develop a simple and easy to use light source, based on Raman scattering in diamond, which generates wavelengths suitable for long wavelength (multi-photon) imaging. Such a source would potentially allow use of long wavelength multi-photon imaging also outside the university research labs.

Alina-Giogiana Mustata & Professor Christopher Linington, University of Glasgow
Chemokine induction by antigen/antibody complexes: a novel mechanism contributing to disease progression in multiple sclerosis
Multiple sclerosis (MS) affects over 1 in 500 people in Scotland, but despite recent advances we still lack any treatments that halt accumulation of disability in this devastating disease. This failure reflects our ignorance of what is actually happening within the patient's brain and spinal cord. This study will build on exciting new findings suggesting this involves an antibody-dependent mechanism that drives a positive feedback loop that sustains inflammatory disease activity within the central

nervous system. This project will seek to validate this hypothesis, which if correct will result in new therapeutic strategies for MS.

Sam Talbot & Dr Paul Reynolds, University of St Andrews
Characterizing the Hippo pathway in renal podocytes
The essential function of the kidney is to ensure excretion of wastes and excess fluid from the body whilst preventing molecules or cells from the blood being lost into the filtrate, urine. The filtration barrier consists of specialist cells - podocytes, as well as endothelial cells and the glomerular basement membrane. Podocytes are specialized epithelial cells that cover the outer surfaces of kidney blood vessels. Podocyte injury is a hallmark of various kidney diseases, including diabetic kidney damage, and a deeper understanding of the molecular and cellular events that lead to podocyte injury and decreased podocyte numbers is needed to create new treatments for kidney disease. The Hippo pathway is a chemical signaling pathway inside cells that orchestrates important cellular functions. This pathway exists in podocytes and we aim to further characterize its actions in these cells. This builds on previous successful work in the Reynolds Lab.

Erin Hodgkinson & Dr Tomoko Iwata, University of Glasgow
Characterization of T-cell checkpoint modulators in carcinogen-induced mouse models of malignant bladder cancer
T-cells play a vital role in controlling cancer progression and it is important to develop therapies against abilities of tumour cells in avoiding the host immune system. The T-cell checkpoint blockade has recently emerged as a promising new therapy for bladder cancer, which otherwise lacks effective chemotherapy. The aim of this project is to determine whether mouse models of malignant bladder cancer induced by tobbaco carcinogen could be a useful model for preclinical studies, by characterising the presence of T-cell checkpoint modulator PD-L1. The availability of suitable in vivo platform will greatly enhance the establishment of this therapy.

Deboarah Moffett & Professor Julie Harris, University of St Andrews
Simulating age-related macular degeneration
People with Age Related Macular Degeneration (AMD) have a progressive visual loss, starting in the middle of their visual field. Increasingly, they must learn to see and read by looking out of the corner of their eye. Training can help people use off-centre vision, but it is hard work and unrewarding. Our goal is to develop a mobile, games-based system for the regular training of vision. We need to design and develop engaging games, yet designers lack the insights required to design for low vision clients. By testing and validating the ‘simulation specs’ we can deliver a low cost means of empowering designers to create.

Cecilia Boz & Dr Neil Henderson, University of Edinburgh
Investigation of pro-fibrogenic pericyte subpopulations in the fibrotic liver
Pericytes are cells that wrap around blood vessels throughout the body. Following injury to the liver pericytes (otherwise known as hepatic stellate cells) become activated, transforming into the key cell type responsible for liver scarring (fibrosis). It has recently been suggested that there are subpopulations of pericytes with differing fibrogenic ('fibrosis-causing') activity and that liver fibrosis is actually a reversible process. Furthermore, it has been reported that some fibrogenic pericytes can undergo reversion to a deactivated state after injury. Therefore studying liver pericyte subpopulations both during the evolution and resolution of fibrosis, should allow the identification of the key fibrogenic subpopulations which can be further studied to identify unique attributes and markers to facilitate specific targeting and generation of new anti-fibrotic treatments for patients with liver fibrosis.

Sama Daryanavard & Dr Jonathan Taylor, University of Glasgow
Compressive sensing of the heartbeat for synchronized 3D imaging
Microscope imaging of small animals such as the zebrafish is teaching us a great deal about heart biology, leading to breakthroughs in treatment of human heart diseases. As part of this, it is useful to monitor the heartbeat to a very high degree of accuracy - both for the direct information that this gives, and because it is crucial if we want to take detailed 3D images of the beating heart. This project will build a new method for monitoring the heartbeat that does not require an expensive video camera and computer, as would usually be the case.

Ross MacDonald (University of St Andrews) & Professor Gary MacFarlane, University of Aberdeen
ARM pain: Who benefits from which management? Analysis of data from the ARM trial
Arm pain is a common reason for people to consult a general practitioners or occupational physican and to be referred to a rheumatologist.The causes of such pain have been related to physical injury (such as repetitive movements in the workplace) and psychological factors. The ARM pain trial is a randomised controlled trial which has examined different ways to manage and timing of

management for arm pain. It has now completed recruitment and follow-up. The aim of this studentship is to examine whether there are characteristics of patients who respond well to particualr treatments. In this way it can contribute to "personalised medicine" in which patients are offered management likely to be effective for them.

Islam Mostafa & Dr Mark Ditzel, University of Edinburgh
Investigating the role of the Ubiquitin-Protein Ligase UBR5 in Hedgehog signalling and intestinal tumourigenesis
Using our novel mouse model we have identified an anti-cancer role for a protein called UBR5 in gastrointestinal tumourigenesis - the third most common cancer in the western world and the second most common cause of cancer mortality. Based on our novel observations, we hypothesise that UBR5 acts to restrain cancer initiation through regulating the activity of an intercellular signalling molecule, called Hedgehog, which in turn controls stem cell behaviour. Stem cells normally function to maintain and repair a healthy tissue repair, but when deregulated can cause cancer. To address UBR5's role in cancer we will examine Hedgehog activity and stem cell function in murine gastrointestinal tumours produced in control or UBR5-deficient animals. If our hypothesis is correct, these findings will help initiate screening and translational studies into preventing and combatting human cancer.

Olivia Baker (University of Cambridge) & Professor Hugh Willison, University of Glasgow
An analysis of complement activation at the node of Ranvier in mouse models of Guillain-Barré syndrome
Guillain-Barré syndrome (GBS) is a severe paralytic neurological disorder affecting the peripheral nervous system that follows minor infections. It can induce complete paralysis, often with permanent untreatable disability. The causative mechanisms in GBS involve antibodies formed in response to infections that injure nerves by activating the inflammation response in the body. This project aims to explore the mechanisms underlying this nerve injury in experimental models of the disease. In particular, an inflammation pathway called the complement cascade will be examined in detail, using a new experimental drug that blocks the activation of the cascade. If effective, this study will bring the drug closer to clinical trials in man.

Hannah Costello & Dr William Fuller, University of Dundee
Palmitoylation of the cardiac L-type calcium channel
Every single heartbeat starts with calcium ions entering the individual cells of the heart. This is a fundamental event that supports life in every organism with a circulatory system. The mechanism underlying this event is well known: calcium ions flow through tiny pores in the surface of the cell, called calcium channels. We have identified a new regulatory pathway for these calcium channels, protein palmitoylation. This investigation will identify which part of a calcium channel molecule is subjected to palmitoylation and will therefore be the first step in identifying how this regulatory pathway controls calcium entry into the heart.

Leire Ledahawsky & Professor Thomas Gillingwater, University of Edinburgh
Investigating the role of calretinin in the regulation of neurodegeneration
Neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease and motor neuron disease are some of the most debilitating and devastating conditions to affect the human population. To date, few treatments exist for these conditions, so new therapeutic targets need to be identified. Calretinin is a calcium binding protein of yet unknown function that we have recently identified as a novel regulator of neurodegeneration in the mammalian nervous system. In this project the student will use cortical neurons from calretinin knockout mice to examine their vulnerability to various neurodegenerative stimuli in vitro.

Martyna Petrulyte & Professor Peter Teismann, University of Aberdeen
Are animals with an extended lifespan due to Nrf2 mediated enhanced antioxidant response less prone to develop Parkinson's disease?
Parkinson's disease (PD) is a common neurodegenerative disorder and, as of today, the pathogenesis remains unknown and only symptomatic treatment is available. This disease can be modelled by the neurotoxin 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP). Lifespan extension due to reduced protein intake is associated with an activation of the antioxidant/xenobiotic response system, which are mainly controlled by a molecule called Nrf2. Increased levels of Nrf2 have also been shown to provide protection in the MPTP-model of PD. We will assess if mice, which have an extended life span due to reduced protein intake are less prone to develop PD, and thus the mechanisms involved could open new avenues for the development of treatments.

Kelvin Cheng & Dr Joanne Edwards, University of Glasgow
Relationship between IKK alpha (IKKα), Oestrogen Receptor alpha (ERα) phosphorylation and clinical outcome measures in ER positive breast cancer

Breast cancer is the most common cancer among females in United Kingdom. Although there has been tremendous advances in the understanding of this disease and its management, recurrence is still a major problem. The NF-κB pathway has been shown to be involved in promoting recurrence in patients with ER-positive breast cancers. We aim to identify the relationship between IKKa, a key member of non canonical NF-κB pathway, phosphorylation of ERα (serines 118 and 167) and clinical outcomes. If it is demonstrated that IKKα is upregulated with the development of Tamoxifen resistance, this will provide evidence for their use as a novel therapeutic agent for Tamoxifen-resistant patients.

Alex Warren & Dr Charlotte Soulsby, University of Glasgow

An analysis of the factors affecting quality of life following intensive care unit admission

Patients who survive critical illness often have a reduced quality of life. This is a complex issue which encompasses physical health needs and rehabilitation, psychological wellbeing, sleep, and social health including return-to-work. The project will use questionnaires to assess the quality of life of a large number of patients who have been admitted to an intensive care unit, and attempt to determine which factors are predictive of quality of life after discharge. It will also compare patients with different comorbidities and types of critical illness.

Jarlath Eastwood & Professor Muriel Caslake, University of Glasgow
The effect of statins on circulating microRNA in patients with hypercholesterolaemia

It is well known that increased levels of cholesterol in the bloodstream leads to its deposition in veins causing complications including heart attacks. Patients with high cholesterol are commonly treated with statins to lower cholesterol. Recent studies have shown that there is a significant correlation between circulating cholesterol and specific microRNA. To date no studies have shown whether these circulating microRNA are altered by statin therapy. The aim of this study is to determine whether statins affect the levels of specific circulating microRNAs. MicroRNAs have potential as therapeutic targets and may have a role in monitoring treatment in patients with hypercholesterolaemia.

Noor Zaidi & Professor Andrew Todd, University of Glasgow
Inhibitory interneurons in the spinal cord that suppress itch

Chronic itch occurs in many diseases, and is a common condition for which we lack suitable treatments. Recent studies have shown that a particular type of genetically-modified mouse develops chronic itch, and have suggested that this is due to loss of a population of nerve cells from the spinal cord. These cells are thought to be activated by scratching the skin (and other stimuli that suppress itch), and to inhibit activity in the itch pathway. In this project, we will test this hypothesis by inactivating these cells in adult mice, and testing the hypothesis that this leads to increased itch.

Victoria Armour & Dr Charlotte Gilhooly, University of Glasgow
Development and validation of a Scottish model for prediction of burns mortality

Severe burns can be complex injuries with sequlae including disfigurement, disability , psychological issues and mortality. Although burns mortality has fallen in recent decades, treatment is still difficult and time consuming. In the past models have been used to predict mortality from burn injury. The aim of this project is to produce a burns prediction model for the Scottish burns population, providing a tool for service evaluation and an aid in clinical decision making which will ultimately ensure that resources are directed to the patients most in need and that decisions in patient care are based upon appropriate evidence.

Shona Borland & Professor Eleanor Davies, University of Glasgow
Analysis of steroidogenic genes in hypertension

High blood pressure (BP) contributes to many diseases such as heart attacks and strokes, which are detrimental to human health. There is evidence that high BP is inherited within families and this may be caused by changes in certain genes. We aim to investigate if there are changes in genes which regulate the production of steroid hormones and therefore contribute to high blood pressure. By elucidating the role of these genes in patients with high BP, we hope to facilitate early diagnosis and treatment of people at risk of high BP and associated cardiovascular disease.

May Tu & Dr Hui-Rong Jiang, University of Strathclyde
Expression of IL-22 in normal and inflamed central nervous system

Multiple sclerosis (MS) is the leading cause of non-traumatic neurological disability with long-standing morbidity. Scotland has the highest prevalence of MS in the world. Although the cause of MS is not clear, it is an autoimmune disease and cytokines play essential roles in the initiation,

development and resolution stages of the disease. Understanding the functions of these cytokines in the development of MS is essential for developing effective therapies. Interleukin-22 (IL-22) is an important modulator of the immune system. We recently observed that the production levels of IL-22 by the lymphoid organs are closely related to the severity of CNS inflammation in experimental autoimmune encephalomyelitis (EAE), an animal model for MS disease. This summer project aims to further understand the role of IL-22 in MS disease by examining the expression of IL-22 in the CNS tissues during the development of EAE.

Iona Imrie & Professor David Gally, University of Edinburgh
Understanding the mechanism of action of an inhibitor of Shiga toxin expression
Escherichia coli strains that produce Shiga toxins cause about 1000 detected infections a year in UK. The more serious infections are associated with bloody diarrhoea and can lead to kidney and neurological damage. A consortium of researchers at Edinburgh University are studying the biology of these enterhaemorrhagic E. coli (EHEC) strains and have identified a small molecule that severely inhibits the amount of toxin that EHEC strains produce. The project will investigate if this inhibition is linked to blocking of the bacterial stress 'SOS' response using fluorescent readouts for SOS gene induction. The work will contribute to our understanding of how the inhibitor functions.

Juliet Tye & Professor Peter Ghazal, University of Edinburgh
The differential regulation of sterol metabolism in neonatal and adult immunity against viral infection
Recent studies have shown that cholesterol metabolism plays a key role in regulating human innate immunity. However, this has yet to be explored in human neonates, which fall in the immuno-compromised group of society. This project aims to determine the presence of an antiviral enzyme, 25-hydroxycholesterol (cholest-5-en-3β, 25-diol, 25HC), thought to also modulate the sterol biosynthesis pathway in adult humans.

Laura Lapienyte & Dr Stephen Tait, University of Glasgow
Developing a new method to detect cancer cells that have survived anti-cancer therapy
The best way to treat cancer is to kill it. Indeed, many treatments do kill cancer cells but, unfortunately, some cancer cells often survive treatment and regrow and become treatment resistant. Cancer therapies kill cancer cells by a process called apoptosis; this is a form of cell suicide whereby the cell actively kills itself. Our recent data shows that cells can trigger apoptosis but survive. Based on our results, we propose that cancer cells surviving this process are more resistant to therapy and grow quicker, in essence, what doesn't kill you makes you stronger. This project will develop a tool to detect cancer cells survivng apoptosis, in order to investigate whether our idea is true. If so, this will lead develop to new ways to kill cancer cells, and by extension treat cancer, more effectively.

Lewis Reynolds & Professor Nikolai Zhelev, Abertay University
Evaluating the therapeutic potential of CDK9 inhibiting compounds in human hypertrophic cardiomyopathy using embryonic stem-cell-derived 'mini-hearts'
The proposed research project aims to study the effects of a cyclin-dependent kinase 9 (CDK9) inhibiting compounds on human cardiac muscle cells. The cells will be derived from embryonic stem cells and propagated in a culture medium to form individual 'mini-hearts'. The cardiac disease, Hypertrophic Cardiomyopathy (HCM), which causes the abnormal enlargement of muscle cells, will be induced in the mini-hearts using two hormones named Angiotensin II and Endothelin-1. As there is currently no satisfactory curative treatment for the disease, use of the CDK9 inhibiting compounds as a potential treatment for HCM will be evaluated.

Chase Schultz-Swarthfigure & Dr Ben Shelley, University of Glasgow
Does Procollagen Peptide III (PCP-III) predict susceptibility to lung injury after cardiac surgery?
Some patients become unwell with breathing problems following heart-surgery. This can be as a result of the surgery or the supportive techniques used during the operation. Breathing problems range from mild to life threatening, with some patients requiring extra support from a ventilator. It is difficult to predict which patients will develop difficulties. This study will analyse blood samples already collected from heart-surgery patients to see if we can predict before the operation which patients will develop breathing problems. In the future this may allow care to be tailored for individual patients with the aim of preventing post-operative breathing problems.

Jordan Weir & Dr Dave Hughes, University of the West of Scotland
High frequency ultrasound detection of diabetic foot disease
Diabetes is an increasing healthcare concern; 15%-25% of patients develop Diabetic Foot Disease (DFD) which can result in amputation. With DFD, tissues undergo a change in stiffness due to changes in the cell-to-cell forces inside the skin's tissue. An ultrasound image is composed of sound

echoes that arise from materials of differing stiffness, and thus it can be used to measure changes in elasticity. Therefore, the aim of this project is to develop high resolution ultrasound probes to image the difference between healthy and diabetic tissues to map out the progression of diabetic foot disease.

Reda Stankunaite & Professor Colin Selman, University of Glasgow
Can ATF-4 activity help explain the variation in ageing rate observed across different recombinant inbred mice?
The percentage of elderly in our population is increasing, with age the primary risk factor for many diseases. Much of what we know about ageing has come from model organisms, i.e. roundworms, fruitflies and mice. We know, that diet, genes and drugs can slow ageing in mice but we still do not understand how this happens. We will study mice that either show slowed, normal or accelerated ageing following reduced food intake, and examine a 'master'protein potentially critical to slowed ageing. We predict that if this protein is an anti-ageing factor, then it will only change in mice which show slowed ageing.

Hollie Craig & Dr Carol Torsney, University of Edinburgh
Evaluating sex differences in the formalin model of peripheral inflammatory pain - a systematic review and meta-analysis
More women are reported to suffer from chronic pain than men. It appears that women and men process pain and respond to analgesics somewhat differently. However, preclinical research that seeks to identify new analgesic targets in animal models of chronic pain has mainly used male animals. Nevertheless, there is a substantial body of research that has used both sexes. Here, we propose to systematically review these studies to establish the extent of sex differences. This review will provide information that is essential to guide how we use data from animal models to identify analgesics specific for both sexes.

Louis Dwyer-Hemmings (University of Cambridge) & Professor Andrew Baker, University of Glasgow
Non-coding RNA and vascular pathology
Diseases of the vascular system are very common and remain important areas for improvement of clinical treatments. We are interested in how the blood vessel wall responds to injury and how we can modify the cells in the blood vessel wall to improve this response. We are interested in using genetic medicines. To achieve this we need to understand how certain molecules, called RNA influence the function of cells in the vessel wall. This is the aim of the current project.

Akshayini Ramaesh (St Andrews & Edinburgh) & Dr Nazir Lone, University of Edinburgh
Long term outcomes of critically ill patients with diabetic ketoacidosis
Diabetic ketoacidosis (DKA) is a life-threatening but avoidable complication of diabetes. It results in uncontrolled blood sugars in combination with increasing blood acid levels. A proportion of patients become extremely ill and require admission to the intensive care unit (ICU). Little research has been published relating to the long-term consequences of severe DKA. Using a 'big data' approach, the project will use a large anonymised database to describe the long-term outcomes (mortality, readmission to hospital, costs) of patients admitted to all Scottish ICUs, and identify those at risk of dying or hospital readmission. This may enable clinicans to better target follow-up care for patients and ultimately improve outcomes.

Raphae Barlas & Professor Phyo Myint, University of Aberdeen
Choice of antithrombotics and long term outcome in stroke
Stroke is a very common condition. Stroke due to clotting of blood vessles (ischaemic stroke) constitutes about 85% of all strokes in Western countries. Drugs that prevent clot formation are the established long term treatment. These drugs either act on platelets or on factors that initiate clotting. They are collectively known as antithrombotics. There are several types of these agents and it is not known whether the choice of specific drug impacts the outcome in ischaemic stroke. This project will use real world data collected through a large stroke registry to answer this research question.

Luke Campbell & Dr Kim Moran-Jones, University of Glasgow
Investigation of the role of autophagy inhibition in pancreatic cancer
Pancreatic cancer is a devastating disease with deaths per year almost equalling diagnoses. Successful treatment is rare with few patients being eligible for surgery. Autophagy is a process by which cells recycle their material, allowing survival when under stress or when treated with anti-cancer therapy. Autophagy is increased in pancreatic cancer, meaning agents inhibiting autophagy have the potential for use as therapeutics in pancreatic cancer. We hope to show that autophagy inhibition kills pancreatic cancer cells. We also intend to investigate whether pancreatic cancers with

specific mutations respond better to inhibition of autophagy, allowing for personalised treatment options.

Charlotte Capitanchik & Professor Nick Gilbert, University of Edinburgh
Molecular characterization of Cornelia de Lange Syndrome derived patient cells: study of protein and gene expression levels
Cornelia de Lange syndrome (CdLS) is caused by mutations in proteins related to the cohesin complex. Recent studies have suggested that components of the cohesin complex affect gene expression patterns, cell cycle progression and DNA supercoiling. We hypothesise that mutations in the cohesin complex could alter gene expression leading to a change in the DNA supercoiling pattern further impacting on chromatin structure and patterns of DNA replication. Thus, the principal aim of this project is to undertake a molecular characterization of CdLS patient derived cells, which will enable us to better understand the underlying disease mechanisms.

Dominika Vojtasova & Dr Vassiliki Fotaki, University of Edinburgh
Elucidating the role of the transcription factor Foxg1 in mouse eye development – insights into ocular coloboma
Coloboma is an eye disorder that affects approximately 1:10,000 children and may result in the child being blind or partially sighted. It originates from impaired formation of the eye during embryonic development. Although both environmental and genetic factors contribute to coloboma, most cases seem to be caused by errors in our genes. However, there are still many cases of coloboma for which the causative gene has not yet been identified. Using the mouse as our experimental model we propose to study the involvement of specific genes in proper eye formation and aim to understand better the causes of coloboma.

Jade Middlemiss & Dr Theodore Henry, Heriot-Watt University
Effect of toxicants on nkx2.5 gene expression and cardiac development in zebrafish
Heart disease affects many people across the world and is often caused by environmental or genetic factors causing abnormalities in heart formation and development. This project seeks to further explore the role of the transcription factor nkx2.5, which is known to be important in playing a role in heart development. This gene is highly similar in humans and zebrafish, making zerbafish a perfect model organism with which to explore how nkx2.5 expression may be affected by toxicants and also to characterise how this will then effect the development and growth of the heart.

Sion Ford & Dr Jayne Hope, University of Edinburgh
Investigation of the effect of cytokines on Mycobacterium avium paratuberculosis and implications for Johne's disease control
Johne's disease (JD) is a chronic gut disease which affects a large number of animals causing significant economic and animal welfare concerns. In order to design effective vaccines to prevent disease we must first understand the changes that occur within infected animals. We propose to study the cells that are associated with the chronic inflammation that is seen in the gut. There are established links between JD in cattle and Crohn's disease in humans. Both Crohn's disease and JD have chronic inflammation in the gut and parallels can be drawn from studies in cattle to aid understanding of human disease.

Catherine Bolton & Dr Ross Goutcher, University of Stirling
Multisensory shape perception - clinical implications
The sophistication and complexity of human behaviour relies on the ability to integrate information across multiple senses. Such multisensory perception is impaired in some clinical populations, such as those on the autistic spectrum, chronic alcoholics and Alzheimer's. Multisensory stimulation is also used as an effective therapeutic technique for many conditions, including dementia. Recent research has revealed much about the mechanisms in the brain that govern multisensory abilities. Currently, however, there are no suitable tests for the clinical assessment of multisensory abilities. This project shall develop a test for multisensory shape perception, aimed at assessing multisensory integration in a clinical setting.

Angus Sinclair & Dr Gillian Currie, University of Edinburgh
Systematic review and meta-analysis of animal models of tetrahydrocannabinol-induced psychosis
Cannabis use is associated with an increased risk of psychosis in vulnerable people. Animal models of psychosis are used to improve our understanding of the underlying causes of psychotic disorders and to test potential therapies. Despite substantial animal research, there have been few advances in treatments for those living with psychosis. To explore potential reasons for this failure to translate positive finding in animals to humans, we will conduct a systematic assessment of all published studies of animal models of psychosis induced by the primary psycho-active compound of cannabis, tetrahydrocannabinol (THC).

Jonathan Lappin & Dr Wenlong Huang, University of Aberdeen
Stimulation of CNS axonal growth by combining novel silk biomaterial and electric field
Following spinal cord injury, communication between the brain and the body below the injury level is disrupted due to the damage to the cord. A hostile injury environment prevents the spinal cord nerve cells to regenerate. To date, no single regenerative strategy has been translated to the clinic. Novel silk biomaterial and electric field application are two promising strategies that promote rodent and xenopus nerve cells to regenerate respectively. Here, we hypothesise that a combination of the two strategies will lead to better regeneration of xenopus nerve cells. The project will inform our future work with mammalian nerve cells regeneration

Mhairi Docherty & Dr Melanie Leggate, Edinburgh Napier University
Does high intensity intermittent exercise increase fat oxidation post exercise in females?
Current physical activity (PA) guidelines (>150minutes exercise/week) are under scrutiny, with 'lack of time' reported as the most common barrier to exercise. It has been argued that PA guidelines focus on individuals already active and are discouraging and over-ambitious for inactive groups. Increased levels of PA can reduce the risks associated with the leading causes of death worldwide: cardiovascular diseases, Type 2 diabetes and respiratory diseases. With physical inactivity costing NHS Scotland an estimated £91 M/annum. High intensity intermittent exercise training (HIIT) is a time-efficient mode of exercise with emerging evidence shown to improve health outcomes in patient populations.

So Yeon Kim & Dr Pasquale Maffia, University of Glasgow
Shining light on heart disease
Atherosclerosis is a disease of the arteries leading to myocardial infarction and stroke. The development of innovative approaches for the molecular imaging of inflammation in atherosclerosis would be key to improve diagnosis and treatment. Surface Enhancement Raman Spectroscopy (SERS) is developing as an effective imaging optical modality in biomedicine. The aim of the proposal is to develop SERS-based system to measure vascular inflammation. We will use metallic nanoparticles (NPs), which possess the ability to recognise inflammatory markers, as imaging probes in in vitro vascular cell cultures. When a light source is shone on these NPs, they can be detected by SERS.

Ryan Wong & Dr Brian Smith, University of Glasgow
SPLUNC1, the connection between low pH and mucous disfunction in Cystic Fibrosis?
SPLUNC1 is a protein found in the lungs and upper airways of humans and has multiple functions. One of the functions of the protein is to keep the lungs lubricated and to prevent them from drying out. In cystic fibrosis sufferers, SPLUNC1 does not work properly as their airways are too acidic, and as a result the mucous in their lungs becomes dehydrated. The aim of the project is to identify why SPLUNC1 doesn't work in the acidic conditions of cystic fibrosis lungs to get a better understanding of the disease.

Megan Leaver & Dr Federica Lopes, University of Edinburgh
How do chemotherapeutic drugs damage human ovary?
Multiple laboratories, including our own, have used animal models to demonstrate that several drugs used in the treatment of cancer have harmful effects on the female reproductive system. Different classes of drugs damage the egg and its associated cells in varying ways. This research project aims to verify our previous findings in humans, by using donor tissue to determine the nature of the damage on human ovaries. Increasing numbers of surviving patients over recent years makes this an increasingly important issue to address. Cisplatin and doxorubicin, two of the most commonly used drugs in cancer treatment, will be investigated.

Kenneth Ngoh & Professor Cathie Sudlow, University of Edinburgh
Confirmation and sub-classification of stroke cases in UK Biobank
Stroke is a major cause of death and adult disability in the UK. Strokes result from a disruption in the brain's blood supply. This can occur in many different ways, resulting in a range of different stroke subtypes. UK Biobank, a very large research resource, following the health of 500,000 UK adults, could help us much better understand the causes of these different stroke subtypes, and so develop more targeted treatments for stroke and its prevention. This project will make this possible, by developing and assessing a novel method to confirm and classify strokes and stroke subtypes in UK Biobank.

Taiba Suddek & Dr Simon Milling, University of Glasgow

Elucidating the role of intracellular *Escherichia coli* in stimulating cytokine production in the mucosa of Crohn's disease patients

Crohn's disease is a common and debilitating condition, caused by inflammation of the intestinal tissues. Damage to the intestinal wall is thought to allow entry of intestinal bacteria into underlying tissues, causing persistent inflammation in patients. Previous studies have suggested a role for the bacterium *Escherichia coli* (*E. coli*) in this process. We will therefore investigate whether the presence of *E. coli* in biopsy samples from the colon of Crohn's disease patients is associated with increased inflammation, compared with healthy patient biopsies. This will provide important insights into how *E. coli* could contribute to intestinal inflammation in Crohn's disease.