Our diabetes research aims to avert the impact of the obesity ‘epidemic’ responsible for the rise in Type 2 Diabetes Mellitus (T2D). Researchers have worked on a number of projects funded by Diabetes UK examining dysregulated cellular lipoprotein metabolism. Supported by major funding agencies, our research assesses islet transplantation, adipokine and lipid biology and cell-to-cell communication, with developing interests in antioxidant function, bacterial infection, retinopathy and inflammatory pain.

Dysregulation of lipid and cholesterol metabolism have been implicated in a growing number of diseases such as Alzheimer’s disease and Type 2 Diabetes Mellitus, both of which are increasing in prevalence in our aging population. In a number of recently funded projects, Professor Graham and research team are investigating the cholesterol trafficking functions of members of the newly discovered family of Steroidogenic Acute Regulatory protein (STAR)-related lipid transfer (START) proteins, and their putative role in modulating cholesterol homeostasis in a variety of cell types.

One aspect of Dr Scobie’s research is safety in xenotransplantation. This novel technology is where living cells, tissues or organs are transferred from one species to another. The European Union (EU) have funded a programme to develop an implant containing insulin secreting pig cells which will potentially replace and/or reduce the need for individuals with Type 1 diabetes to have regular insulin injections (xenislet.eu). Individuals with Type 1 diabetes are unable to produce the hormone insulin in their pancreas to regulate blood sugar levels and need regular insulin injections to supplement this. These individuals are also susceptible to the development of chronic complications which are detrimental to the patient and costly to the NHS.

Human cell transplants are already being used to treat some Type 1 patients. The technique - called islet transplantation - takes cells from the pancreas of a dead human donor which are then injected into the liver of a patient where they begin to produce insulin. However, the treatment is expensive (though in the UK it is available for a few on the NHS), there are very few donors available and patients also need to take drugs to suppress the immune system to stop the cells being rejected, which can have unpleasant side effects. It is hoped that the use of animal cells will circumvent these issues, indeed, there is no
need for immune-suppression with the proposed medical implant and GCU is working on the safety aspects of using pig cells.

The team, co-ordinated by Prof Pierre Gianello in Belgium, is building on an earlier study known as the Xenome project which demonstrated that in an animal model, the implant could correct diabetes for up to six months. The new study will aim to take this forward and hopefully implement a clinical trial in Europe to treat Type 1 diabetes using this novel approach.

GCU’s Dr Xinhua Shu is working to understand the pathogenesis and develop therapeutic strategies for retinal diseases, using zebrafish as a model. Diabetic retinopathy (DR) is the leading cause of blindness for working age individuals, 78-98% diabetes will progress to DR within 15 years of diagnosis. Oxidative stress is believed to play a key role in the development of DR. High glucose levels increase the release of reactive oxygen species, superoxide levels are increased in the retina of diabetic rat and in retinal cells growing within high glucose media. In diabetes, the activities of anti-oxidative enzymes responsible for scavenging free radicals and maintaining redox homeostasis such as superoxide dismutase, glutathione reductase, glutathione peroxidise, and catalase are diminished in the retina. Researchers are investigating the functional of some key antioxidant enzymes in the pathogenesis of DR to understand the disease mechanisms of DR and help to develop therapeutic strategies for treating patients with DR.

Diabetes is a chronic disease which is greatly underestimated and often undetected, particularly in certain counties. It is responsible for lower limb and foot amputation, neuropathy, arterial diseases and kidney failure. Diabetic foot problems are among the most serious and costly complications of diabetes, with lower limb amputations performed as a result of the disease.

The need for accurate foot risk stratification for patients with diabetes and access to foot clinics is high on the agenda for the Scottish Government and the NHS. The Scottish Diabetes Foot Action Group, supported by the NHS, the Scottish Government and Diabetes UK, has launched a new ‘CPR (Check, Protect, Refer) for Feet’ campaign, which encourages ward staff to check the feet of patients with diabetes admitted to hospital.

Complications of diabetes include diabetic neuropathy, which can ultimately lead to ulceration and amputation of the toes, feet and lower limbs. Diabetic neuropathy is one of the most common of the long-term complications of diabetes, which could be affecting a good percentage up to 50% of patients. Loss of feeling is a particular risk because it can allow foot injuries to escape notice and treatment. To help understand the mechanisms underlying these events Dr Patricia Martin and Research team have established a Diabetic skin tissue bank enabling tissue and cells isolated from donated skin to be used in in vitro experiments. The team have identified Connexins, certain proteins that permit cells to communicate with each other, as therapeutic targets for Diabetic wound healing.

Professor of Podiatry Stuart Baird is pioneering education and training programmes in the UK, the Middle East, India and Far East and campaigning for greater awareness of the serious effects of the illness, supported by partners including Pfizer, one of the largest research-based pharmaceutical companies in the world.

At Glasgow Caledonian University, we work with industry and public sector partners to ensure our expertise responds to the need for real world innovation. GCU’s strategic business development and knowledge transfer teams work with academic experts in our Schools and Research Institutes to support businesses with a problem-solving approach.

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Further information:
Dr Patricia Martin
School of Health and Life Sciences
Glasgow Caledonian University
Patricia.Martin@gcu.ac.uk
0141 331 3726
www.gcu.ac.uk/hls