The University Of Queensland
AUSTRALIA

CREATE CHANGE

Biomedical Sciences

Cardiac disease and therapy group

Dr Reichelt heads the Cardiac Disease and Therapy group, focused on optimising heart function in clinically relevant small animal models of cardiovascular disease including chronic high blood pressure, heart ischemia (lack of blood flow), diabetes, ageing and cardiotoxicity associated with cancer therapy. Our research spans studies of single cell populations (cell culture), isolated heart function, and function of the intact heart. This approach is integrated with advanced techniques for gene editing to target specific cell subtypes in the heart to modify receptor expression and function. This ability to intervene in a time- and cell-subtype-specific manner with gene therapy has many applications which are currently being pursued by the Cardiac Disease and Therapy group.

Intravascular ultrasound imaging (IVUS) for assessment inside coronary artery, cardiac catheterization laboratory.

Services

Isolated heart assessment of cardiac function; Detailed vascular and functional assessment of cardiac function in isolated hearts in response to drug infusion or gene modification; includes assessment of contractile function (systolic, diastolic) and vascular tone (coronary vasodilation/vasoconstriction).

Detailed assessment of recovery from ischemia-reperfusion in isolated hearts including assessment of ischemic injury (contracture), recovery of contractile function (systolic, diastolic), coronary vascular perfusion, cell death assays (effluent lactate dehydrogenase and troponin, TTC staining).

In vivo evaluation of cardiac function using ultrahigh resolution ultrasound (Vevo 3100) including systolic assessment in neonatal mice through to aged animals. Diastolic dysfunction assessed in ~14day old mice.

Animal models of chronic cardiac disease including

- Cardiac infarct (left anterior descending artery occlusion)
- Cardiac ischemia-reperfusion (left anterior descending artery occlusion with reperfusion)
- Transverse Aortic Constriction-induced pathological hypertrophy
- Angiotensin II-induced hypertrophy
- Models of type 1 (streptozotocin) and type 2 (high fat) diabetes

Adeno-associated virus (AAV)-induced gene expression: we routinely design and produce AAVs to direct gene expression in cardiomyocytes including secreted peptides, G-protein-coupled receptors and growth factor receptors.

AAV-based Cre expression (used with floxed mice): building on the success of the Cre-lox mouse model, we have developed adeno-associated viruses that target cardiomyocytes from deletion in animals as young as P1 neonates up to 18-month mice (and older if required). We have confirmed robust expression of our AAV-cTNT-eGFP-T2A-iCre and gene deletion in several floxed mouse models. This model significantly reduces animal costs associated with complex breeding strategies.

UQ's School of Biomedical Sciences – mission statement:

By harnessing our diversity across the breadth of biomedical science, we will generate, disseminate and apply foundational biology underpinning health and disease to inspire and empower the next generation of leading researchers, educators, and healthcare professionals to innovate together for better health outcomes globally. Our innovative research encompasses basic discovery through translational pathways to medical solutions:

Cell architecture: We use sophisticated molecular and imaging techniques to explain how various cellular components and pathways contribute to building healthy bodies.

Receptors and signalling: We decipher the passage of external messages from the cell surface, through cytoplasmic signalling pathways, and ultimately to genetic regulatory circuits in the nucleus.

Chronic disease: We characterise the genetic, molecular and cellular microenvironments associated with diseases, such as Alzheimer's disease, cancer, MND and others.

Drug design and development: We identify critical biological targets and design drugs based on structural analyses to develop novel therapies.

Functional and comparative anatomy: Our interdisciplinary studies of structure and function across phylogenetically disparate species advance our understanding of the human body in healthy, aging and diseased states.

Injury and repair: We study fundamental mechanisms of cells in response to stress, consequences of repair processes and how these may be influenced for optimal outcomes.

Musculoskeletal and motor control: We develop and apply novel tools, to investigate muscle function and neural control of muscles in humans.

Neurobiology and brain function: We search for and discover genetic and environmental factors that lead to and maintain healthy nervous systems.

Reproduction: We investigate the genetic and molecular environment during early fetal development to advance reproductive technologies and facilitate healthy pregnancies.

Contact

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