THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE

Biomedical Sciences

Welcome

Welcome to the School of Biomedical Sciences (SBMS), a multi-disciplinary teaching and research School within the Faculty of Medicine at the University of Queensland.

SBMS teaches over 15000 students each year in science, health and medical courses across a broad range of disciplines including anatomy, physiology, pharmacology, pathology, neuroscience, developmental and cell biology.

Studying biomedical science provides a pathway to a diverse range of career opportunities in medicine, clinical and pharmaceutical occupations, and discovery and translational research. Our innovative and high-quality teaching is based on the latest research to ensure you graduate with world-class skills, knowledge and understanding.

Our research spans nine research themes and aims to understand the structure and function of the human body in health and disease. Our knowledge gains are directed at helping to make healthy pregnancies, healthy bodies, healthy minds and healthy aging with many of our academics collaborating with clinical and/or industry partners.

Professor Elizabeth Coulson
Head of School

4 clinical trials underway based on discoveries from our School

Excellence in Research for Australia (ERA) rating 5 in Neuroscience and Pharmacology

100 honours and 100 higher degree research students

$53 million research and teaching income

$15 million fully equipped teaching laboratories

World-class teaching

We offer opportunities in Honours and research higher degrees, together with undergraduate biomedical science courses across seven disciplines:

- **Anatomy** is the study of the structural organisation of living things from the microscopic (histology) to the macroscopic (organs and skeleton) level.
- **Cell biology** is the study of the structure and function of cells, including how these features contribute to the physiology of organisms.
- **Developmental biology** is the study of the processes by which organisms grow and develop.
- **Neuroscience** is the study of the nervous system and how it controls the physiology and behaviour of an organism.
- **Pathology** is the identification and classification of diseased tissue.
- **Pharmacology** is the study of chemical agents (drugs), which exert an effect on a cell, tissue, organ, or organism. It includes developing as well as testing medicines.
- **Physiology** is the study of the function of cells, tissues and organ systems within the body.

Undergraduate Research

SBMS is a distinguished centre for teaching and research. Undergraduate students can explore what a career in research might be like, by participating in the SBMS Summer or Winter Research Programs, or by undertaking a small research project in their third year. Following your three year undergraduate degree, a typical pathway for entering research includes an Honours year, undertaking a larger project in biomedical science research. While undertaking their research, students work in advanced laboratory settings under the mentorship and supervision of some of the university's leading academics and researchers.

HDR Students

SBMS offers an enriching experience for students undertaking their Higher Degrees by Research (HDR). Students are encouraged to tailor their research program to their specific interests and to participate in our active and vibrant research culture. Our HDR students obtain broader research skills by having dual supervisors and we have regular postgraduate symposia that provide experience in presenting research findings to a wider audience. Academic success demands that researchers present their results to the wider scientific community, and SBMS offers opportunities for students to attend national and international scientific conferences. This exposure enables researchers to gain critical analysis of their work. We recognise the significance of these events and provide financial support for postgraduate students to attend and present at conferences.

International impact

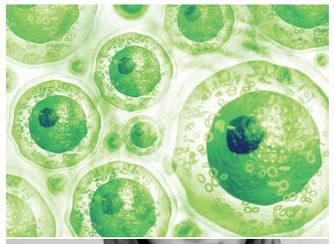
We operate under the principle that the training of future biomedical scientists should be, like science itself, a global enterprise. Our students enjoy exchange agreements with prestigious international institutions, including Oxford University in the UK and Ludwig Maximilians University (LMU) in Germany. Our global, collaborative focus is exemplified by productive relationships with:

- The MD Anderson Cancer Center at the University of Texas
- State University of New York (SUNY) Buffalo
- US Department of Defense
- University of Cambridge
- University of Birmingham
- University College London
- National University of Singapore
- Simon Fraser University
- Xi'n Jiaotong University
- Yeungnam University
- Hanyang University
- University of Nantes
- Mayo Clinic

Research strengths

Biomedical science lies at the interface of the genome and the cell, the fundamental unit of all living organisms.

At UQ we are advancing our understanding of how these interactions contribute to the function of the human body in health and disease, with a particular research focus on:



Cell architecture

The cell is the basic building block of the human body. We are interrogating their inner components using sophisticated molecular and imaging techniques to explain how they are integrated to build healthy bodies and how they keep bodies healthy during aging.

Chronic disease

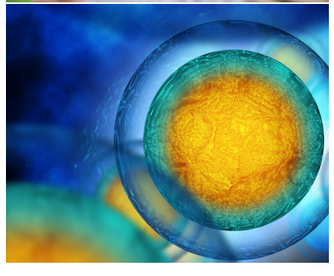
Chronic disease is highly pervasive in Australia and includes conditions such as cancer, diabetes, cardiovascular disease, and mental health disorders. We are using a multipronged approach to characterise the genetic, molecular and cellular microenvironments associated with these diseases.

Drug design and development

Drugs are an essential arsenal in the fight against human diseases and disorders. Our researchers are identifying critical biological targets, designing drugs based on structural analyses to develop candidate therapies and testing their *in vivo* efficacy.

Functional and comparative anatomy

Our interdisciplinary studies of structure and function across phylogenetically disparate species provides us with new knowledge and advances our conceptual understanding of the function of the human body in healthy, aging and diseased states.



Injury and repair

Cellular injury occurs when cells are subjected to stress, such as occurs in direct traumatic insult, exposure to environmental stress or poor blood supply and reperfusion. The repair response to the injury can either restore, or lead to permanent change in the organ structure and function. SBMS researchers are studying some fundamental mechanisms of cells to stress, the consequences of repair responses and how these may be influenced.

Innovation in biomedical education

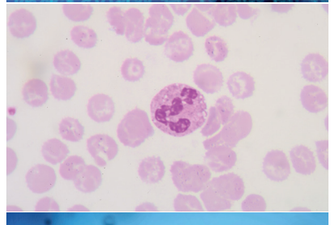
We are obtaining insights into how students learn in the biomedical sciences by investigating how students grasp ideas and communicate science, the learning processes they adopt during their studies and their engagement with technology. Our research supports the development of innovative methods to improve students' learning experiences and aid their success.

Musculoskeletal and motor control

Learning to control our muscles is essential for normal healthy development and for rehabilitation after injury or illness. We are developing and applying novel tools, from the single cell level to the coordination of muscle groups, to investigate muscle function and their neural control in humans.

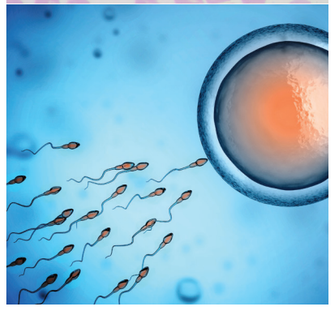
Neurobiology and brain function

Restoring function in human developmental and neurodegenerative disorders and in brain and spinal cord injuries is our major challenge. We are searching for and discovering genetic and environmental factors that make and keep nervous systems healthy.



Receptors and signaling

Cell-to-cell communication underpins the normal functioning of human organs and is a prime target for drug discovery. We are deciphering the passage of external messages from the cell surface, through cytoplasmic signalling pathways, and ultimately to genetic regulatory circuits in the nucleus.



Reproduction

Normal human development requires the initial healthy generation of gametes, successful fertilisation and then nurturing of the fertilised egg by the maternal-fetal interface. We are probing the genetic and molecular environment of this continuum to advance reproductive technologies and help keep pregnancies healthy.

Specialist facilities

Our core facilities and research laboratories are equipped with cutting-edge equipment and instrumentation that provide outstanding spaces for world-class teaching, research, and commercial services. Our highly qualified staff are available for consultation, training and contract services

Analytical facility
From the quantification of gene and protein expression to the interrogation of cellular metabolism, mitochondrial function or cell behaviours, our analytical facility offers a wide range of state-of-the-art instruments to accelerate your research.

Gross Anatomy Facility
Queensland's largest anatomical prosection and skeletal teaching collection and fully equipped dedicated anatomy laboratories provides the necessary infrastructure to support world-leading medical and professional training.

Histology facility
The facility is fully equipped with specialised systems for a diverse array of specimen preparations, slide production, histo-chemical staining, and slide scanning capabilities.

Imaging facility
The SBMS core imaging facility is renowned for its advanced imaging capabilities, from live and fixed cell imaging to 3D image reconstruction and analysis.

Integrated Physiology Facility (IPF)
The IPF offers researchers advanced equipment to study physiology in in vivo pre-clinical animal models. The IPF is equipped with sophisticated telemetry, surgical, imaging and phenotyping systems.

Integrated Pathology Learning Centre (IPLC)
Located in the centre of the Royal Brisbane and Women's Hospital, the IPLC houses a large collection of over 5000 human pathology specimens. This remarkable collection is used in UQ's medical teaching as well the IPLC's Secondary School's Program, teaching students from regional and metropolitan schools.

Industry partnerships

We partner with a wide range of local and international companies to advance research across the biomedical sciences. These include partnerships with leading Pharmaceutical companies aimed at identifying new therapeutics for brain disease and pain. We also perform contract research studies with Industry partners to test therapeutics and develop new approaches to tackle human disease.

Some of our past and ongoing partnerships include Pfizer, Takeda, Grünenthal, and CSL Behring.

We also educate undergraduate and post-graduate students in drug development and biomedical research translation. These provide our students with Industry-valued skills that can be used in the future workforce.

Pfizer

Takeda

GRÜNENTHAL

CSL Behring

Rejuvenating the immune system supports brain repair after injury

SBMS Researchers identified a major shift in how to treat brain injuries, after rejuvenating immune cells to support the repair process.

The study focused on the brain's learning and memory centre, the hippocampus, and its unique ability to produce new brain nerve cells during adult life, which is critical for learning.

The team used animal models to investigate how the immune system interacts with brain nerve cells after injury and how this influenced the ability to learn and remember.

UQ School of Biomedical Sciences and Queensland Brain Institute researcher Dr Jana Vukovic said up until now, the brain's immune cells, known as microglia, were considered to drive inflammation, resulting in cognitive deficits after injury.

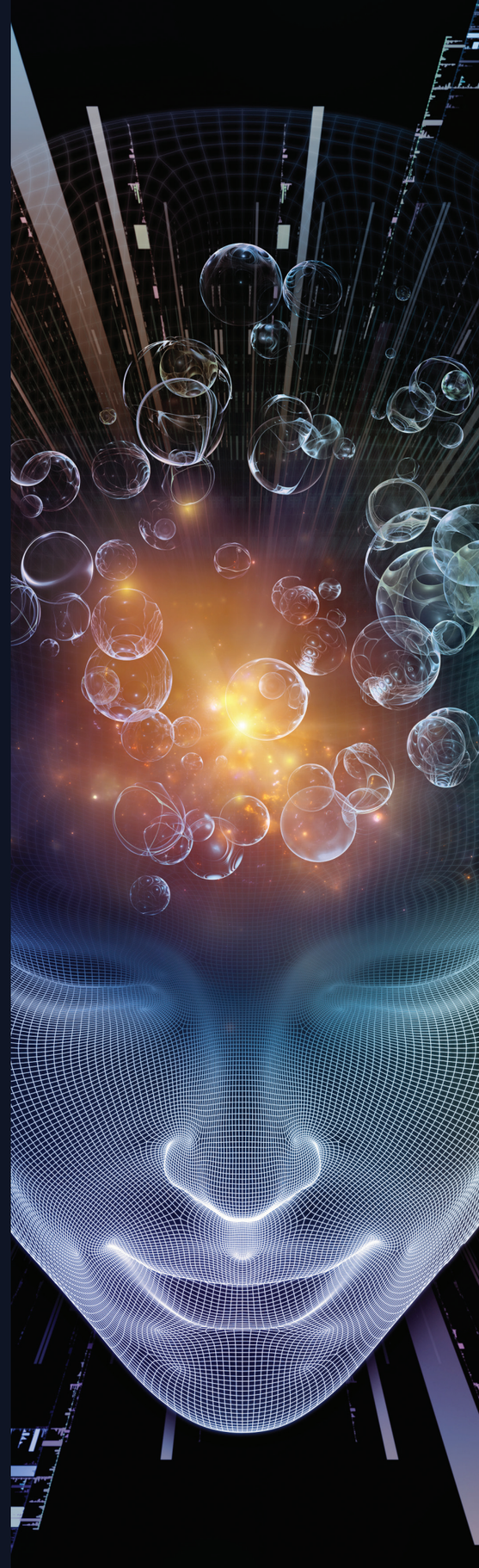
"However, when we removed microglia from mice we were surprised that there was absolutely no change in their behaviour or ability to repair brain tissue," she said.

Dr Vukovic's team then depleted microglia and allowed them to repopulate the brain, finding this profoundly increased brain repair.

"The rejuvenated microglia improved the mice's learning and memory, preserved tissue loss and stimulated the birth of neurons," said Dr Vukovic.

"We have shown that microglia, in part, have been misunderstood and that we need to learn more about how they support and stimulate pathways to promote repair."

The findings may lead to the development of therapeutics that alleviate learning and memory deficits associated with a wide range of neurological conditions, such as brain injury and dementia.



You can improve lives too

Our researchers need your support, and all donations make an impact. Through your generosity, you can contribute vital funding to:

- advance life-improving and life-saving research projects
- provide critical research equipment
- support promising stundent and researchers' careers
- attract senior researchers to further world-class research in our own backyard.

To discuss your tax-deductible research gift, contact:

Tori Darnell

Deputy Director, Advancement
Faculty of Medicine
The University of Queensland

T: +61 7 3365 5075
M: +61 438 821 851
E: t.darnell@uq.edu.au
W: medicine.uq.edu.au/philanthropy

Contact us

Level 1, Macgregor Building (#64)
The University of Queensland
St Lucia QLD 4072, Australia

General enquiries
E: sbms@enquire.uq.edu.au
T: (07) 3365 3132

CRICOS Provider 00025B

THE UNIVERSITY OF QUEENSLAND
AUSTRALIA

CREATE CHANGE