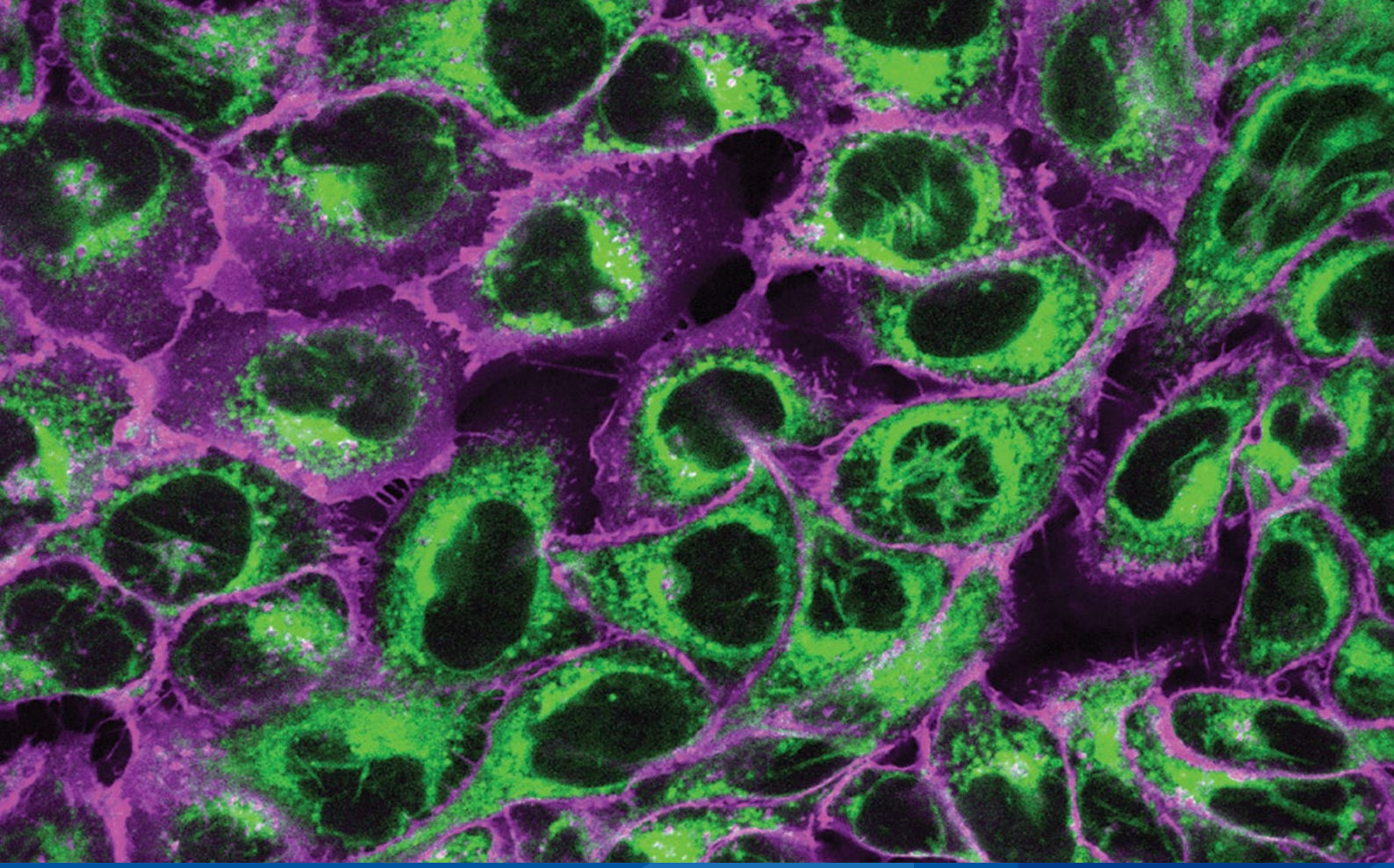

School of Pharmacy and Medical Sciences

University of South Australia

South Australia's pioneers in Pharmacy and Medical Science education.

Delivering over 50 years of experience in quality education.

Front cover image courtesy of Dr Christie Bader:
Prostate cells with ER membrane staining.

Welcome

Welcome to the School of Pharmacy and Medical Sciences at the University of South Australia. We are proud to give you a snapshot of our applied research and professional education, enriched by the expert knowledge of staff, state-of-the-art facilities, and strong partnerships with industry, community, and professional bodies.

Our long-standing commitment to outcomes-based research, brings together a range of internationally recognised research centres that provide solutions to current and future real-world challenges. Having a presence in the University of South Australia Cancer Research Institute (UniSA CRI) is a testament to this; situated in Adelaide's thriving BioMed City, it positions us perfectly to improve health outcomes across the globe through future collaborative research.

We are the only institution in South Australia to offer fully accredited degrees in pharmacy and laboratory medicine, along with a suite of degrees that are responsive to the needs of our students, professions, and employers. Many of our academic staff are actively engaged with their respective professional bodies, which provides students with authentic learning experiences that will enable them to successfully contribute to their future professional roles.

Our culture of excellence sustains the continued relevance of our research and teaching. I look forward to connecting with you and working together.

Professor Alan Boddy /
Head of School: School of Pharmacy and Medical Sciences
Director: UniSA Cancer Research Institute

The University of South Australia is a globally connected and engaged university helping to solve the problems of industry and the professions. We are also South Australia's largest university with over 31,000 students located across six campuses. Our teaching is industry-informed, our research is inventive and adventurous. We create knowledge that is central to global economic and social prosperity. Our graduates are the new professionals, global citizens at ease with the world and ready to create and respond to change. We are Australia's University of Enterprise.

WELL ABOVE

WORLD-CLASS

RESEARCH

In Pharmacology and Pharmaceutical Sciences, Nutrition and Dietetics, Human Movement and Sport Sciences, Nursing, Biochemistry and Cell Biology, and Medical Physiology.

2018 Excellence in Research for Australia (ERA)

RANKED 25 IN THE WORLD'S

TOP 50 UNDER 50

2019 QS Top 50 Universities Aged Under 50

RANKED IN THE

TOP 40 BEST UNIVERSITIES

IN THE ASIA PACIFIC

Ranked #36, 2019 THE Asia-Pacific University Rankings

Pharmacy and Medical Sciences at a glance

130+

HDR STUDENTS

CONTRIBUTING TO NEW KNOWLEDGE IN THE FIELD

RESEARCH COLLABORATIONS

IN 35+ COUNTRIES

INCLUDING CHINA, DENMARK, GERMANY AND THE UNITED STATES OF AMERICA

INVESTED

A$247MILLION

IN THE NEW UNIVERSITY OF SOUTH AUSTRALIA CANCER RESEARCH INSTITUTE

A$15MILLION+

IN RESEARCH INCOME IN 2018

21PATENTS

FILED IN 9 COUNTRIES AND/OR REGIONS BETWEEN 2015-2018

University of South Australia Cancer Research Institute

Located in the heart of Adelaide BioMed City, the A$247 million Cancer Research Institute (UniSA CRI) opened in 2018 and is home to one of the most significant concentrations of cancer researchers in the state.

The building features the latest tools and technologies to support improvement in patient diagnostics and treatment, while presenting a number of health, research, teaching and community engagement opportunities. Many pharmacy and pharmaceutical science subjects are taught in the building, giving students access to state-of-the-art learning facilities.

UniSA CRI is also home to the Centre for Cancer Biology, a partnership between UniSA and SA Pathology that carries out a world-class program of innovative research; and MOD., UniSA's futuristic museum of discovery that offers immersive experiences through dynamic exhibitions.

To find out more, please visit **unisa.edu.au/cri**

Image courtesy of Insight Visuals (photographer Chris Oaten)

Impact-driven research outcomes

Through research collaborations across more than 35 countries, the School of Pharmacy and Medical Sciences generated more than A$15 million in research income in 2018.

From the molecular to the global, UniSA's researchers are involved in a diverse range of research activities across a broad spectrum of strength areas, including cancer and pharmaceuticals.

Expert partnership paves the way for new vital medications

Mayne Pharma's Vice President of Scientific Affairs, Dr Stuart Mudge says working together with Pharmacometric research staff at UniSA and with other science collaborators has been invaluable.

Mayne Pharma won US Food and Drug Administration (FDA) approval for Tolsura™, a new patented capsule formulation of itraconazole, which is an antifungal drug treatment for certain systemic fungal infections that most commonly occur in vulnerable or immunocompromised patients such as cancer, transplant and HIV/AIDs patients.

And much of the detailed modelling of the drug took place at UniSA.

"Drug Regulators increasingly expect pharmacometric analysis to be included within applications to market new drugs, including new formulations of existing drugs like Tolsura™, Dr Mudge says.

"Data generated in the collaboration with the UniSA's expert Pharmacometrics researchers contributed significantly to the successful regulatory and clinical strategy behind commercialisation of Tolsura™ in Australia, Europe, and the USA."

MAKING MEDICINE USE SAFE

Each year, medication errors and adverse drug reactions cost the Australian health system A$1.4 billion and lead to 250,000 hospital admissions. Professor Libby Roughead is determined to change that.

Professor Roughead is one of the leaders of Australia's new Digital Health Cooperative Research Centre and a National Health and Medical Research Council (NHMRC)-funded Senior Principal Research Fellow at UniSA. She and her team are determining problems and testing solutions for medicines use and evaluating improvements in health care.

She also runs the innovative Veterans' MATES (Medicines Advice and Therapeutics Education Services) program, which over the past decade has helped more than 300,000 war veterans, war widows and their GPs choose medicines wisely.

REVOLUTIONARY CELL IMAGING HELPS CANCER FIGHT

Professor Doug Brooks and Associate Professor Sally Plush have a unique partnership that has revolutionised live cell imaging and the quest to cure cancer and other diseases. A biologist and a chemist respectively, they came together to develop fluorescent molecular probes that allow researchers to see things they previously couldn't inside human cells.

Their company Rezolve Scientific now supplies laboratories in Europe and Asia. Professor Brooks also uses the technology in his own research into cell transport systems that is developing better ways to diagnose cancers, particularly prostate cancer, which kills 3,300 males in Australia each year.

LEADING THE SEARCH FOR NEW CANCER DRUGS

Professor Shudong Wang has received millions of dollars in competitive grants and industry funding, including A$5 million between 2015-2018, to develop new medicines for cancer patients.

She leads a multi-disciplinary team of more than 20 researchers, with programs spanning drug design, medicinal chemistry, cellular and animal pharmacology. Several drug candidates have been developed towards the clinic for treating leukaemia, glioblastoma and cancer of the breast, prostate and ovary.

With more than 360 new cases of cancer diagnosed in Australia every day, the drugs developed by Professor Wang's group offer the opportunity for a significant improvement in cancer treatment.

GIVING BABIES THE BEST START

How a baby grows before birth can affect its health for life. Professor Janna Morrison is working to understand these effects, and develop strategies to help babies born too small or too early.

As a fetal physiologist, she leads a UniSA team that has introduced advanced imaging techniques like MRI to its exploration of dimensions of the early origins of adult health, from maternal nutrition and fetal growth to how babies are affected by medicines.

Currently an Australian Research Council (ARC) Future Fellow (Level 3), Professor Morrison is also a South Australian Tall Poppy of Science and a Fellow of the Cardiovascular Section of the American Physiological Society.

VACCINE INNOVATIONS WILL HELP MILLIONS

Food allergies are one of the world's fastest growing health burdens, with peanut allergies alone having an estimated impact of $20 billion in the US. Professor John Hayball's team have collaborated with leading Australian biotechnology company Sementis Ltd, to pioneer a novel vaccine that may provide much-needed protection against food allergies. Now being prepared for future human clinical trials, the vaccine is designed to permanently reprogram a person's immune system from an allergic to tolerant status.

Together with Sementis Ltd, Professor Hayball's team have also adapted the world's most successful vaccine against smallpox to create a new and accessible vaccine to fight the modern scourges of Zika virus, and are working with the United States National Institute of Health and other national and international collaborators to further build on its potential.

FROM MOLECULES TO MEDICINES

Professor Sanjay Garg and his team are taking new compounds from bench to clinic for both human and veterinary applications.

An example is an innovative long-acting intramuscular injection of the highly unstable drug, omeprazole. This has revolutionised the treatment of equine gastric ulcers, an extremely prevalent and medically important condition affecting more than 250,000 horses in Australia and 10 million in the US.

Developed in collaboration with Luoda Pharma in Australia and the UK, the product has already shown extraordinary commercial potential. It has been tested by European vets in thousands of horses, and registration is under way with European agencies.

PREVENTING METHAMPHETAMINE USE THROUGH KNOWLEDGE AND AWARENESS

Methamphetamine use is a significant problem in Australia and approximately half of young people are unaware that methamphetamine has long-lasting effects on health.

Awarded more than A$230,000 by the Fay Fuller Foundation, Associate Professor Gabrielle Todd and colleagues discovered disturbing similarities between the brains of young methamphetamine users and older people who have been diagnosed with Parkinson's disease.

Associate Professor Todd's team developed an evidence-based, ready-to-use TV advertisement, aimed at raising awareness about the similarities and to help discourage young people from using the drug.

MONITORING THE ICE EPIDEMIC

Detecting ice and other illicit drugs in wastewater provides vital information about the scale of use and the success of intervention strategies.

UniSA has developed a world-leading capability in this complex blend of chemistry and pharmacology, fine-tuning the ability to differentiate between a range of drugs present in minute quantities in wastewater and to tailor analysis to suit specific needs.

Dr Cobus Gerber now leads the team, which provides detailed data for SA Health and the WA Police, and was called upon by the Australian Criminal Intelligence Commission to assess the potential to maintain a permanent national monitoring capability.

Our facilities and areas of specialty support strong ties with industry, and as the #1 University in Australia for Industry Research Income[1], our research capabilities positively contribute to:

DEVELOPMENT AND OPTIMAL USE OF MEDICINES

BIOLOGY OF HEALTH AND DISEASE

FOOD, NUTRITION AND HEALTH

1. 2019 *THE* World University Rankings

CELL AND MOLECULAR BIOLOGY

> Cell Biology, confocal microscopy, live cell imaging, *in vitro* cell models, immunochemistry, ELISA, histology, molecular biology, protein biophysics

> Target-driven biochemical and cell-based assays (Multi-mode reader, Flow cytometer, Auto-western blotting system, etc.)

CHEMISTRY

> Cell Biology, confocal microscopy, live cell imaging, *in vitro* cell models, immunochemistry, ELISA, histology, molecular biology, protein biophysics

> Target-driven biochemical and cell-based assays (Multi-mode reader, Flow cytometer, Auto-western blotting system, etc.)

> Therapeutic development from small molecule drug discovery to biologics and cell therapies

> Analytical chemistry for structure determination, quantitation and trace analysis.

ANIMAL MODELS OF HUMAN DISEASE

> Live animal model work: Rodent models of pathophysiology, sheep models of reproductive biology, OGTR – approved insect facility

> State of the art animal facility and live animal imaging equipment (micro-CT and bioluminescence).

DATA ANALYSIS

> Capacity for analysis of population-level data sets

> Cyber-secure facilities for sensitive personal data

> Machine learning and high-end statistical analysis

> Pharmacokinetic modelling, simulations, pharmacometrics, apps for clinical and pharmaceutical education.

FOOD AND NUTRITION

> Commercial grade kitchen and food preparation facilities and sensory analysis facility. Food and natural product analysis capabilities.

PHARMACEUTICAL SCIENCE

> Medicines formulation and testing facilities, including nanoparticle manufacture

> Pharmaceutical formulation and drug delivery systems for more effective and safer delivery of therapeutics

> Taking new drug molecules through preclinical development and clinical trials.

GENETICS

> Expertise and facilities for the use of fruit flies *(Drosophila)* as models of genetic modification.

Quality in teaching

As the #1 Young University in Australia for Teaching Quality[1], we are proud of our rich knowledge base and excellent teaching and research facilities.

Pharmacy and pharmaceutical science students learn in state-of-the-art, purpose-built facilities and laboratories in the University of South Australia Cancer Research Institute. More than 70 students can be hosted in the laboratories, and collaboration and interactivity are fostered through access to digital learning suites.

Extensive teaching facilities span across UniSA City East and City West campuses, including the new Pharmacy Practice Integrated Learning Suite (PPILS), purpose-built laboratories for Biology, Histopathology and Haematology, a refurbished Chemistry Laboratory, and a dedicated Nutrition and Food Sciences Hub encompassing a Microbiology Laboratory, Sensory Laboratory and a A$2 million Commercial Kitchen.

1. 2018 *THE* Young University Rankings

Dr Jacinta Johnson was named 2018 Early Career Pharmacist of the Year by the Pharmaceutical Society of Australia - for good reason.

Dr Johnson combines a high-profile job and research program with a commitment to help others follow in her footsteps.

Currently Senior Pharmacist Medication Safety for Southern Adelaide Local Health Network, Jacinta also lectures and coordinates pharmacy practice courses to educate future health professionals at UniSA.

She says teaching is one of the most satisfying things she does.

"I love it when I see pharmacy students apply something I have taught them previously. I'm still a bit amazed when it dawns on me that I have helped to shape that future pharmacist.

"Working across settings as a teacher practitioner is fantastic. At the hospital, it's my job to review practice and systems to improve patient outcomes whenever medicines are used, and I can share the things I learn by bringing them into my teaching at the university."

Among her many other roles, Dr Johnson is Vice President of the Society of Hospital Pharmacists of Australia.

Dr Maurizio Costabile loves helping students learn and "seeing that lightbulb moment in their eyes when they get it."

The secret, he says, is to combine passionate teaching, new technologies and innovative thinking.

This involves employing analogies to simplify individual concepts, then using mind maps to help link broader concepts together.

"To be a good teacher you have to have a good way of translating information. It can't just be transmission of facts; there has to be some colour and importantly, there has to be some relevance."

An early digital advocate, Dr Costabile has developed a number of interactive simulations that allow students to embrace important but complex ideas in biochemistry and immunology. One of these simulation tools was recognised globally by the Online Learning Consortium.

He has received numerous other Australian and international teaching accolades, including a prestigious Office for Learning and Teaching Citation for Outstanding Contribution to Student Learning, and has been a finalist in the STEM Educator of the Year awards.

Dr Jackie O'Flaherty has revolutionised teaching at UniSA and won local, national and international awards in the process.

Most important to her, however, is developing strong bonds with her students to help them learn.

"I try to make sure they are all involved in the learning process and progressing regardless of their talents, abilities or learning styles."

Dr O'Flaherty was a successful research scientist before realising her passion for teaching, and she has since developed a range of biosciences courses for health and medical science students.

An early adopter of new technologies, she has focused strongly on online learning, particularly for students who live at a distance. Among other initiatives, she developed a short course to smooth the transition for students beginning university, which won an International Online Effective Practice Award in 2018.

Her many other awards include an OLT National Australian Award for University Teaching Excellence and an Open Universities Australia National Award for Excellence in the engagement of students studying online.

Our programs are designed to prepare graduates for their future, across a broad range of rewarding careers.

Pharmacy

The only degree of its kind in South Australia, and rated in the top 5 universities nationally for employment, student satisfaction and teaching quality in Pharmacy.*

**QILT: Graduate Outcomes Survey Course Experience Questionnaire 2016-18 – Full-time Employment, Overall Satisfaction and Teaching Quality Indicators (Undergraduate). Public SA-founded universities only.*

Laboratory Medicine

The only degree of its kind in South Australia accredited by the Australian Institute of Medical Scientists (AIMS).

Pharmaceutical Science

The only degree of its kind in South Australia, delivered by a university with well above world-class research in Pharmacology and Pharmaceutical Sciences.*

**2018 Excellence in Research for Australia (ERA).*

Medical Science

A degree tailored to meet student and industry needs across pharmacology, cancer biology, physiology, molecular methods and infection and immunity.

Nutrition and Food Sciences

Meeting the growing demand for food scientists and informed by well above world-class research in nutrition and dietetics.*

**2018 Excellence in Research for Australia (ERA).*

The Next Generation

Our students are equipped with the skills to meet industry needs, forging rewarding careers in their profession and leading the way in South Australia and beyond.

POSTGRADUATE RESEARCH BUILT ON A COLLABORATIVE CULTURE

Hannah Thomas won UniSA's prestigious 3-Minute Thesis award for succinctly explaining a complex PhD program that could help diabetics around the world.

Every 20 seconds, someone somewhere has a limb amputated. Being diabetic, they lack a type of vascular cell that controls inflammation and helps damaged blood cells rebuild, and the repercussions are literally crippling.

Hannah's research investigated therapies that can restore the vital missing cells.

"I joined my laboratory because of its strength in collaboration and ties to industry. We all work on different models of healing and these real-world factors make me feel as though the work we do can make a difference.

"My PhD has taught me an incredible amount and I have really enjoyed the collaborative and grounded culture within our research group. It is my hope that the continuation of this work will translate into therapies that can encourage better healing of diabetic wounds."

POTENTIAL OBESITY CURE

Pharmacy (Honours) and Pharmaceutical Science graduate, Dr Tahnee Dening, is enjoying national attention following a discovery made while completing her PhD at UniSA.

Investigating the oral absorption of drugs in the body, she noticed that the clay materials she was using were attracting fat droplets and soaking them up under mimicked gut conditions.

"This behaviour immediately signalled we could be onto something significant – potentially a cure for obesity."

Awarded an Endeavour Postgraduate Scholarship, Dr Dening's research career has taken her around the world, from Denmark to Belgium, and now to the United States.

"You don't have to be on the frontline of health care to help patients. I love knowing that my research could contribute towards smarter and more effective medicines."

AN APPETITE FOR SCIENCE

Studying Nutrition and Food Sciences has steered Scott Woollett into an exciting career as a Microbiology Specialist, who works to keep consumable products safe and tasting great.

In Australia alone, the food and beverage, grocery and fresh produce sector has an industry turnover of A$131.3 billion*, so it's no wonder Scott has had the opportunity to make important improvements to the beverages produced at Lion Australia and New Zealand.

"As part of my role, I led a research project from our Technical Centre in Yokohama, Japan, that looked into cider-specific spoilage microorganisms and how they could possibly impact cider production in Australia. The findings from this project informed changes to the way our company produces cider."

*Australian Food and Grocery Council (AFGC) State of the Industry 2018 report.

UniSA's purpose-built Pharmacy Practice Integrated Learning Suite (PPILS) enables pharmacy students to learn how to dispense medicines, counsel patients, and develop the clinical service delivery skills needed for contemporary pharmacy practice.

University of South Australia

CONNECT WITH US

unisa.edu.au/pmbs

Email: pharmacy.medicalsciences@unisa.edu.au

Telephone: +61 8 8302 2391

Information correct at time of printing (April 2019)

CRICOS provider number 00121B

For information specific to international students, please visit *unisa.edu.au/international*

Australia's University of Enterprise

ARTIST: RIKURANI

Acknowledgment of Country

UniSA respects the Kaurna, Boandik and Barngarla peoples' spiritual relationship with their country. We also acknowledge the diversity of Aboriginal peoples, past and present.

Find out more about the University's commitment to reconciliation at unisa.edu.au/RAP