Faculty Centre for Urology Research (CUR)

Annual Report 2021

Mission: To enhance our knowledge of the lower urinary tract with the aim of developing new treatments or enhancing current treatments of the following conditions:

- Overactive and underactive bladder
- Prostate and bladder cancers
- Stress incontinence
- Benign prostatic hyperplasia
- Interstitial cystitis
- Erectile dysfunction
- Faecal incontinence

ACADEMIC MEMBERS OF THE CENTRE

- **Professor Russ Chess-Williams (Pharmacologist, Centre Director)**
  Research interest: Identification of cellular targets for drug development for use in the treatment of lower urinary tract functional disorders and cancers.

- **Dr Stephan Levonis (Medicinal Chemist)**
  Research interest: Synthetic chemistry and computational drug design for cancer treatments.

- **Dr Iris Lim (Biomedical Scientist)**
  Research interests: Pathophysiology and treatment of ureteral stones.

- **Dr Professor Anna Salinas (Biochemist)**
  Research interest: Molecular modelling of uroplakins and bacterial adhesion.

- **Dr Catherine McDermott (Toxicologist)**
  Research interests: Prostate and bladder cancer, cytotoxic drugs, psychological stress and the bladder.

- **Dr Kylie Mills (Biomedical Scientist)**
  Research interest: Interstitial cystitis, bladder inflammation and afferent nerve function

- **Dr Christian Moro (Physiologist/Cell Biologist)**
  Research interest: Overactive and underactive bladder, inflammation.

- **Dr Katie Powell (Cell Biologist)**
  Research interest: Cell motility and prostate/bladder cancer

- **Dr Joan Roehl (Pathologist/Cell Biologist)**
  Research interest: Cancer biology and cell motility

- **Dr Stephanie Schweiker (Medicinal Chemist)**
  Research interests: Synthetic chemistry and computational drug design for cancer treatments

- **Dr Donna Sellers (Physiologist/Pharmacologist)**
  Research interests: Overactive bladder, diabetes & psychological stress

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HONORARY MEMBERS

- Prof Hikaru Hashitani (Graduate Medical School, Nagoya City University, Japan)
- Dr Vivien Wong (Urogynaecologist, Robina, Pindara & Varsity hospitals, Gold Coast)
- Prof David Christie (Radiation Oncologist, Genesis Care, Gold Coast)

RESEARCH STUDENTS

Higher Degree Research students (PhD)

- Caleb Kam
- Hyon Jeong (Minnie) Kim
- Andy Koh
- Damian Nilsson
- Amanda Tauber
- Eleanor West
- Eliza West
- Jessica Smith
- Caitlin Wunsch

HDR students (Masters)

- Neil Josen Delos Reyes
- Aidan McKeon

Honours

- Liam O'Callaghan
- Charlotte Phelps
- Hafsa Hersi

OVERVIEW OF ACTIVITIES 2021

As you might expect 2021 was another year with Covid travel restrictions and problems with deliveries. All members of the Centre are heavily involved in teaching and the challenges of dealing with combined onsite and online teaching has left less time for research. It should be noted that the Centre does not currently have any full-time research-only staff. However, research output was substantial, participation in Society conferences continued and a record number of prizes were collected during the year. The usual exchange of research students with Japanese and Swedish laboratories was not possible with covid, but our relationships with these groups remains excellent with online meetings and the delivery of joint workshops.

Summary of 2021 Achievements (details of these below)

- A total of twelve prizes/awards received by Centre students and staff during 2021.
- Three reviews, 19 original papers and 9 abstracts published.
- Graduation of two Honours students and one PhD candidate.
- First online meetings with Kashiv Biosciences
- First data obtained for lubricin on the inflamed bladder

2022 AND BEYOND …… THE CHALLENGES

During 2021, Covid made meetings with the advisory team difficult to organise, but one meeting was held online in December and the discussions of future challenges are summarised below. Additional strategic advice was obtained during two planning meetings (19/08/2021 and 17/11/2021), external consultant, Professor Michael Kimlin. The main focus of these meetings concerned attracting external funding, in particular partnership grant applications with the NHMRC and MRFF.

1. The Centre faces a number of challenges in 2022, the most major being the lack of external funding. With the great difficulties and low success rates with NHMRC, the Centre will need to focus on alternative sources of income. Over the past 5 years, we have established a number of animal models of disease (interstitial cystitis, diabetes, overactive bladder, psychological stress) and with staff experienced in working with big Pharma and drug development (RCW and DJS), collaborations with local smaller biomedical science companies could be developed. We are currently establishing relationships with a number of companies including LTR Medical based in Brisbane, Lubris in the USA and Kashiv Biosciences in India. We have signed non-disclosure agreements with all three companies and are in discussions about possible studies and grant applications. During 2022, the development and strengthening of these relationships will be a priority, with the ultimate aim of establishing a continuing income stream, or drug development programs, that could be used to apply for Partnership schemes with national grant awarding bodies (e.g. NHMRC and MRFF).

2. Another challenge for the future will be setting up end-user or patient representation. Professor Dirk van Helden (University of Newcastle) was the Centre's external advisor in 2021, but a second external advisor needs to be appointed. Professor van Helden had a career as an NHMRC Senior Research Fellow and has extensive experience in funding academic research. He suggested that we try to appoint someone from the Continence Foundation of Australia (CFA), who would be in a good position to

contribute to these discussions of patient representation. The CFA represents patient groups as well as incontinence health professionals. The CEO of the CFA, Rowan Cockerell, has accepted an invitation to join the Centre's Advisory Board for 2022. She has been involved with other institutions trying to increase end-user representation.

3. Another challenge for 2022, will be maintaining HDR numbers. The research students are the powerhouse for our research and critical to maintaining direction and output. Several HDR students are about to complete their PhDs in 2022 and new students will need to be recruited. Going into 2022, we have several Honours/Masters students moving to PhDs at the beginning of 2022, but no students to replace them at Honours/Masters level. The challenge to recruit new students will therefore arise towards the end of 2022. We intend of overcome this problem by using contacts at other universities to recruit (we have good relationships with urology researchers at Monash, UNSW, Adelaide and Flinders). We will also promote our undergraduate Biomedical Science Research Projects at Bond. In previous years these projects have lead to students undertaking Honour projects and ultimately enrolling in PhDs.

CURRENT RESEARCH PROJECTS

LOWER URINARY TRACT PATHOPHYSIOLOGY PROJECTS

[1] Psychological stress and bladder dysfunction

Incontinence in patients can cause stress but it is also well established, based on studies in military personnel returning home, that psychological stress itself can cause bladder dysfunction and incontinence. These studies are being undertaken to identify the pathological changes that occur within the bladder that lead to dysfunction.

Several models of psychological stress have been developed in our laboratories and we are now publishing papers on the effects of stress on bladder function from voiding in conscious animals to cystometry in anaesthetised mice, isolated bladder and sensory nerve responses, histology and cell function.

[2] Control of bladder vascular tone and blood flow

In recent years the importance of blood flow to the lower urinary tract has been identified as a major contributor to bladder overactivity and prostatic enlargement. These studies examine the arteries supplying the bladder with blood to identify which neurotransmitters, receptor and ion channels are important in the control of blood flow through these vessels. Surprisingly many of the drugs that were developed to treat lower urinary tract conditions because of their effects on bladder smooth muscle (B3-adrenoceptor agonists, α1-adrenceptor antagonists) also influence blood flow in the pelvic region suggesting changes in blood flow might actually contribute to their clinical effectiveness in overactive bladder syndrome.

[3] Bladder inflammation and afferent nerve activity

One of the greatest clinical problems in Urology currently is Interstitial cystitis/bladder pain syndrome (IC/BPS) where patients have a number of lower urinary tract symptoms the most serious being pelvic pain. This is an inflammatory condition that occurs in the absence of infection and current treatments are diverse and rarely effective. This is the area of urology with the greatest need for a new effective treatment. The development of new therapies is hindered by our lack of knowledge of the condition.

In our laboratories we have set up an animal model for this condition. Mice are treated with cyclophosphamide a chemotherapeutic agent used in the treatment of several cancers and immune disorders. It thus serves as a model for the study of the urinary side effects observed in patients following treatment for these conditions. A small metabolite is produced from this drug that causes irritation and inflammation of the bladder as it is excreted in the urine.
Mice are treated with cyclophosphamide and the effects of the subsequent inflammation on bladder function (contraction, afferent and efferent nerve activity, etc) investigated. Potential new treatments can also be assessed. We also have developed another model of radiation induced inflammation, where animals can be irradiated at the Translational Research Centre in Brisbane before being transported to Bond for studies examining many different tissues but including the bladder. Radiation induced bladder inflammation is a major problem for patients undergoing radiotherapy for conditions such as prostate cancer.

[4] Ureter physiology and treatments for renal stones
Stones formed in the kidneys cause extreme pain as they pass down the ureters and into the bladder. Our studies are investigating the mechanism involved in regulating contractions of the ureter using porcine ureter as a model of human contractile activity. We are identifying which receptors and ion channels and hormones control these contractions, with the aim of identifying new therapeutic targets and ultimately new treatments.

PROSTATE AND BLADDER CANCER PROJECTS

[5] Prostate Cancer and prazosin/doxazosin
Quinazoline based α1-adrencoeptor antagonists have been used for decades to treat hypertension (USA) and benign prostatic hyperplasia (enlarged prostate, global use). However high concentrations are also cytotoxic and our studies in the laboratory have examined the mechanisms involved in this action. On human prostatic cell lines we found these drugs are cytotoxic, via mechanisms involving stimulation of apoptosis and autophagy, and inhibition of cell motility. In collaboration with Prof David Christie at Genesis Care we have used their facilities to irradiate our human cancer cells and found that prazosin enhanced the cytotoxic effects of radiation on cancer cells. Furthermore in studies mimicking the hypoxic conditions (low oxygen) found within a tumour these drugs have an even greater effect in promoting cell death after irradiation.

The studies in cell cultures were further supported in a retrospective study of patients undergoing radiotherapy for prostate cancer at Genesis Care. Patient records revealed that patients who were receiving prazosin (for benign conditions) during radiotherapy had far better outcomes after treatment if they happened to be taking prazosin at the time of radiotherapy. We are currently performing a small prospective dose-finding trial in patients at Genesis Care in preparation for a larger clinical trial if funding can be obtained.

In 2022 similar cancer cell studies will be performed in the laboratory investigating the potential usefulness of these drugs in treating bladder cancer.

[6] Synthesis and Evaluation of Sialyltranferase Inhibitors.
This project aims to design, synthesise, structurally elucidate, and assay the activity of novel examples in a class of drug-like compounds known as sialyltransferase inhibitors. Sialyltransferase inhibitors are compounds that are known to inhibit the action of sialyltranferases. Sialyltransferases are the proteins responsible for attaching sialic acid residues to the outer surface of a human cell. It is commonly observed that in the cancerous state sialyltransferase activity is increased causing an increase in the quantity of sialic acid residues present on the cell surface. This hypersialylation is reported to be a contributing factor to the metastasis of cancers and the progression of disease. Our research aims to

further explore this area of study with the assay of human cell lines to evaluate directly their sialylation. This work is enabling us to better understand the working of cell-surface carbohydrates in aberrant cells such as cholangiocarcinoma. This work is made possible in part by funding provided by Rotary Health Sandy Bay in the form of a partial PhD stipend, and has so far generated a Q1 publication with 2 further manuscripts underway. Preliminary results show success in creating a novel synthetic compound that not only prevents hypersialylation in a cholangiocarcoinoma cell line, but also seems to prevent cell division without toxicity.

[7] Design and synthesis of selective PARP14 inhibitors.
Parp14 (poly ADP ribose polymerase member 14, aka ARTD8) belongs to a family of 17 enzymes which catalyse the addition of ADP-ribose units onto target proteins. In recent literature, PARP14 has drawn attention as being a candidate for the design of drug-like compounds with potential anti-cancer effects. Although its function is still under investigation, overall PARP14 is shown to promote the Warburg effect, which is observed in cancer cells. The Warburg effect then promotes the growth of cancerous cells in hypoxic environment through metabolic advantage, but is still present even under normoxic conditions. Furthermore, PARP14 promotes a number of other pro-survival pathways increasing cancer's resistance to common chemotherapy. By synthesising and evaluating inhibitors selective for PARP14, we might gain insight into the direction of future therapies. Under this broad topic we have 2 recent PhD candidates submit their theses, and a new PhD student has just commenced in 2022.

PRIZES AND AWARDS IN 2021

Hafsa Hersi – Prize for Best Honours student presentation at the National Symposium on Urogenital and Gastrointestinal Research (online).

Minnie Kim – Prize for best oral presentation, Analytical Chemistry, The sixth Queensland Annual Chemistry Symposium (QACS 2021).

Damian Nilsson – Prize for Best HDR Poster at the Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists (ASCEPT) 2021

Iris Lim receives her Australian Physiological Society Award.

Iris Lim – Awarded the Physiology Education Grant by the Australian Physiological Society.

Christian Moro – Michael Roberts Excellence in Physiology Education Award from the Australian Physiological Society.

Stephan Levonis, Amanda Tauber, Stephanie Schweiker – Chemistry Team - HSM Faculty Learning and Teaching Award for Excellence in Teaching, 2021.

Charlotte Phelps – overall Winner and People's Choice Winner, Pitching Research Competition. Bond University, Gold Coast, Australia.

Charlotte Phelps – Winner, Early Career Researcher Kick-starter Competition. Wiley, Physiological Society, and American Physiological Society.

Amanda Tauber – Prize for best oral presentation, Chemical Education, The sixth Queensland Annual Chemistry Symposium (QACS 2021).

Eleanor West – Prize for Best Oral Presentation at the National Symposium on Urogenital and Gastrointestinal Research (online).

RESEARCH COLLABORATIONS

University of Gothenburg, Sweden - Prior to covid, the Centre received Masters research students from the School of Pharmacy in Gothenburg and our staff have also visited their laboratories. The exchanges have ceased during covid, but our relationship with this research group has been maintained and in 2021 we ran a workshop on natural medicines at the International Continence Society annual meeting. Student exchanges are likely to start again in 2023.

Nagoya City University, Japan – We have developed close relationships with researchers at the Medical School in Nagoya. Research students and staff exchanges regularly occurred prior to covid, Prof Hashitani is an honorary adjunct at Bond and RCW is a visiting Professor in Nagoya. The two professors have visited each others' laboratories many times and they have been joint speakers together at many international symposia. Iris lim has also undertaken a sabbatical in Nagoya before covid struck. In 2021 we published our first joint paper with this group.

Yale School of Medicine and Oregon Health and Science University (OHSU), USA – Dr Stephanie Schweiker and Dr Stephan Levonis are waiting for travel restrictions to end which will allow the start of a collaboration with Dr Michael Cohen (OHSU) and Dr Ganesh Vasan (Yale) in the USA. Joint student projects and student exchanges have been planned but student exchanges are currently on hold.

Genesis Care and Griffith University, Gold Coast – We have previously collaborated with colleagues at Genesis Care (David Christie) and Griffith University (Shai Dukie) to investigating the cytotoxic effects of the prazosin and doxazosin in the laboratory, and later in a retrospective study in prostate cancer patients. We will now continue with this collaboration, with a small prospective study in patients at Genesis Care. Ramsay Health have given permission and allocated time for Liam King, a pharmacist at John Flynn Private Hospital, to undertake these studies and ethical approval was granted for this study to be undertaken at GenesisCare.

RESEARCH STUDENT SUPERVISION/TRAINING

With relatively high teaching loads for staff, the research students are critical to the success of the Centre. In 2021 the Centre had 10 PhD students, 2 Masters by Research and 2 Honours students enrolled. In addition, some staff were involved in the supervision of several research projects for undergraduate Biomedical Science students and MD projects for medical students. During the year, all Honours projects were successfully completed, one HDR student graduated with a PhD and another submitted her PhD thesis.

Successful Honours Completions:

- **Hafsa Hersi** – Effects of intravesical DMSO on bladder function.
- **Liam O'Callaghan** – Alpha1-adrenoceptor antagonists and prostate cancer cell migration.
- **Caitlin Wunsch** - Design, Synthesis and Evaluation of Selective Poly (ADP-ribose) polymerase Member 14 Macrodomain Inhibitors to Potentially Inhibit the Metabolism of Glucose in Cancerous Cells

PhD submissions

- **Andy Koh** – The effects of preworkout supplements on the cardiovascular system
- **Eleanor West** – The effects of inflammation on the afferent and efferent nerve responses of the bladder

EXTERNAL COMMITTEE MEMBERSHIP

Russ Chess-Williams

- International Consultation on Incontinence (ICI) (Cell Biology Panel member)
- International Continence Society (ICS) Scientific Committee
- International Continence Society, Organising Committee for 2021 annual conference
- ASCEPT Urogential and Gastrointestinal Special Interest Group (Co-chair)
- ASCEPT Scientific Committee
- State Education & Activities Committee (SEAC), Queensland committee of the CFA.
- ANZ Continence Journal Editorial Board
- Naunyn-Schmeidebergs Archives of Pharmacology Editorial Board

Dr Stephan Levonis

- Royal Australian Chemical Institute, Queensland Chemical Education Group

Dr Stephanie Schweiker

- Chemical Education for the Royal Australian Chemical Institute (National Division Treasurer)

Dr Donna Sellers

- Quality Use of Medicines (Gold Coast)
- ASCEPT Urogential and Gastrointestinal Special Interest Group (Secretary)
- Frontiers in Pharmacology Editorial Board

Dr Christian Moro

- ANZ Continence Journal Editorial Board

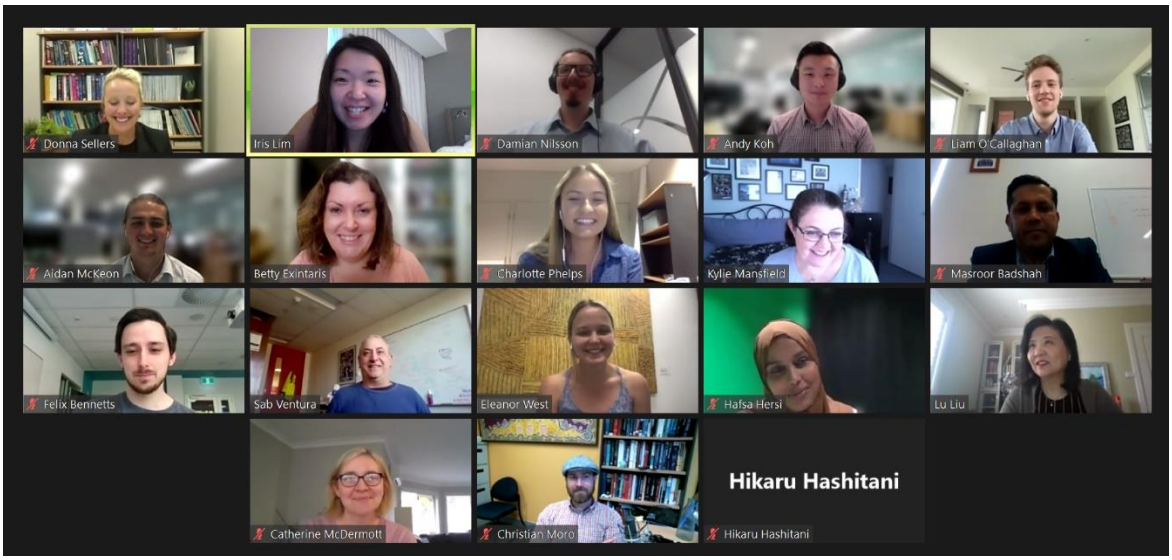
CONFERENCES/WORKSHOPS ORGANISED BY CENTRE STAFF

1. **International Continence Society** Annual Meeting (online). Workshop organised and presented: "Alternative and natural treatments for bladder incontinence." Presenters: Donna Sellers, Christian Moro, Iris Lim and Catherine McDermott from the Centre, and our research collaborators Betty Exintaris (Monash) and Kylie Mansfield (Wollongong).

2. **The sixth Queensland Annual Chemistry Symposium (QACS 2021).** Griffith University, Gold Coast, in-person meeting, organised by Stephanie Schweiker (Treasurer).

3. **RACI National Chemical Education Symposium**. Stephanie Schweiker (Treasurer & chair).

4. **2nd Virtual Education Symposium:** International perspectives on the transition to online teaching, organised by Iris Lim (CUR) and Betty Exintaris (Monash).
5. **National Symposium on Recent Advances in Urogenital and Gastrointestinal Research. (online, photo below).** National online meeting organised by Donna Sellers.



CONFERENCE PRESENTATIONS

INTERNATIONAL

- **International Continence Society** (poster/oral presentations by Damian Nilsson and Eleanor West). Workshop by Donna Sellers, Christian Moro, Catherine McDermott and Iris Lim.

NATIONAL

- **National Conference on Incontinence** (NCOI). Workshop on natural products for incontinence similar to ICS meeting. Presentations by HDR students Damian Nilsson and Eleanor West.
- **Australian Society of Clinical and Experimental Pharmacologists and Toxicologists** (Damian Nilsson and Eleanor West).
- **National Symposium on Recent Advances in Urogenital & Gastrointestinal Research** (Session Chair: Iris Lim, Poster/oral: Damian Nilsson and Eleanor West).
- **2nd Virtual Education Symposium: International perspectives on the transition to online teaching.** Organised by Iris Lim. Presentations by Christian Moro, Charlotte Phelps and Vineesha Veer.
- **HSM L&T Webinar Series**, Bond University (invited speakers, Stephan Levonis and Stephanie Schweiker, 2021)
- **Professional Development Breakfast** for Health & Science Teachers, Bond University (Invited speaker, Stephanie Schweiker, 2021)
- **The sixth Queensland Annual Chemistry Symposium (QACS 2021).** Griffith University, Gold Coast, in-person meeting, (speakers: Amanda Tauber, Minnie Kim, Caleb Kam).
- **RACI National Chemical Education Symposium**, 2021, Online. (Amanda Tauber)
- **School of Chemistry & Molecular Biosciences** at the University of Queensland, (Invited speaker, Stephanie Schweiker)

CURRENT FUNDING

- Australian Bladder Foundation "Lubricin: Innovative intravesical therapy for bladder dysfunction?" - $14,280 (Sellers, Chess-Williams, McDermott)
- RIGB – Joint support for animal facility with CJ Centre for Regenerative Medicine ($11,779)
- ECR Seed grant to Iris Lim – Faculty of Health Sciences & Medicine, Bond University
- Rotary Club Sandy Bay – Australian Rotary Health Scholarship awarded to Hyo Jeong (Minnie) Kim - $49,000
- Physiological Society Education Research grant (Iris Lim) - $3,000

PUBLICATIONS 2021

REVIEWS

King L, Christie D, Dare W, Bernaitis N, Chess-Williams R, McDermott C, Forbes A, Anoopkumar-Dukie S, (2021) Quinazoline alpha-adrenoreceptor blockers as an adjunct cancer treatment: From bench to bedside. European Journal of PharmacologyVolume 89315 February 2021 Article number 173831.

Chess-Williams R, McDermott C, Sellers DJ, West E, Mills K (2021) Psychological stress and lower urinary tract symptoms. Lower Urinary Tract Symptoms (LUTS) 13(4):414-424.

Lim I, Sellers DJ., Chess-Williams R. (2021) Current and emerging pharmacological targets for medical expulsive therapy. Basic and Clinical Pharmacology and Toxicology Open access 2021. DOI: 10.1111/bcpt.13613

PEER-REVIEWED ORIGINAL PAPERS

West, EG, Sellers, D.J., Chess-Williams, R. and Mc Dermott, C. (2021) Bladder overactivity induced by psychological stress in female mice is associated with enhanced bladder contractility. Life Sciences Article number 118735.

Lim, I, Mitsui R., Kameda M., Sellers, DJ, Chess-Williams, R & Hashitani, H (2021) Comparative effects of angiotensin II on muscularis mucosae and detrusor in the pig urinary bladder. Neurourology and Urodynamics 40(1): 102-111.

Tauber, A. L., Levonis, S. M., & Schweiker, S. S. (2022). Gamified Virtual Laboratory Experience for In-Person and Distance Students. Journal of Chemical Education, 99(3), 1183-1189.

Kim, H. J., Schweiker, S., Powell, K., & Levonis, S. (2022). An efficient and robust HPLC method to determine the sialylation levels of human epithelial cells. Plos one, 17(1), e0257178.

Schweiker, Stephanie S., and Stephan M. Levonis. "Lightboard Videos." Chemistry in Australia March-May (2021): 20.

Tauber AL.Schweiker SS. Levonis SM (2021) The potential association between PARP14 and SARS-CoV-2 infection (COVID-19). Future Medicinal Chemistry Open Access Volume 13(6), 587 – 592.

Levonis S.M.,Tauber A.L.,Schweiker S.S.(2021) 360 C Virtual Laboratory Tour with Embedded Skills Videos Journal of Chemical Education Open Access 98,(2), 651 – 654.

Moro C.,Phelps C.a,Veer V.,Clark J.,Glasziou Pb,Tikkinen K.A.O., ,Scott A.M (2021) The effectiveness of parasympathomimetics for treating underactive bladder: A systematic review and meta-analysis. Neurourology and Urodynamics2021 DOI: 10.1002/nau.24839

Moro C.,Phelps C.,Redmond P.,Stromberga Z. (2021) HoloLens and mobile augmented reality in medical and health science education: A randomised controlled trial. British Journal of Educational TechnologyOpen AccessVolume 52, Issue 2, Pages 680 - 694

Stromberga Z.,Phelps C.,Smith J.,Moro C. (2021) Advances in Experimental Teaching with Disruptive Technology: The Use of Augmented, Virtual, and Mixed Reality (HoloLens) for Disease Education. Medicine and BiologyOpen AccessVolume 1317, Pages 147 - 1622021

Koh, A.H.W., Chess-Williams, R. and Lohning, A.E. (2021) HPLC-UV-QDa analysis of *Citrus aurantium*-labelled pre-workout supplements suggest only a minority contain the plant extract. Journal of Pharmaceutical and Biomedical Analysis 193, Article number 113746. https://doi.org/10.1016/j.jpba.2020.113746

Lim, I, Christiansen, C. & Chess-Williams, R (2021) The effects of 17β-estradiol on ureteral contractility: A role for the G-protein coupled receptor estrogen receptor. European Journal of Pharmacology 899: article number 174024.

Moro C.,Birt J.,Stromberga Z.,Phelps Ca,Clark J.,Glasziou P,Scott A.M. (2021) Virtual and Augmented Reality Enhancements to Medical and Science Student Physiology and Anatomy Test Performance: A Systematic Review and Meta-Analysis. Anatomical Sciences EducationVolume 14, Issue 3, 368 - 376

Jones C.,Jones D,Moro C. (2021) Use of virtual and augmented reality-based interventions in health education to improve dementia knowledge and attitudes: An integrative review. BMJ 11, 111, Article number e053616

Keogh J.W.L.Moro C.,Knudson D. (2021) Promoting learning of biomechanical concepts with game-based activities. Sports Biomechanics, Open Access2021

Koh A.H.W., Chess-Williams R & Lohning, A. (2021) Renal artery responses to trace amines: multiple and differential mechanisms of action. Life Sciences 277: article number 119532.

Koh, A.H.W., Chess-Williams, R. & Lohning, A.E. (2021) Racemic synephrine found in Citrus aurantium listed pre-workout supplements suggest a non-plant based origin. Drug Testing & Anal 13(8), 1569-1575.

Mills, West, Sellers, Chess-Williams and McDermott (2021) Psychological stress induced bladder overactivity in female mice is associated with enhance afferent nerve activity. . Scientific Reports 11(1), Article number 17508.

West EG, Sellers DJ, Chess-Williams R & McDermott C (2021) The anxiolytic sertraline reduces the impact of psychological stress on bladder function in mice. Life Sciences 278: Article number 119598.

PUBLISHED CONFERENCE ABSTRACTS

International Continence Society (online)

Nilsson D, Chess-Williams R, Sellers DJ. (2021) Potentiating effect of tadalafil and sildenafil on vasodilation of the porcine superior vesical artery. Abstract number 474. Abstract available at: https://www.ics.org/2021/abstract/474

West EJ, Sellers DJ, McDermott C, Chess-Williams R. (2021) Chloroacetaldehyde , the toxic metabolite of cyclophosphamide, alters urinary bladder function. Abstract number 470. Abstract available at: https://www.ics.org/2021/abstract/470

Australian Physiological Society 60th Diamond Jubilee Conference.

Phelps, C., Chess-Williams, R., & Moro, C. (2021) Identifying novel mediators of contraction within the urinary bladder urothelium and lamina propria tissue layers. Abstract available at: http://aups.org.au/Meetings/202011/images/2021_AuPS_AbstractBooklet.pdf

Australian Society of Clinical & Experimental Pharmacologists & Toxicologists

West EJ, Sellers DJ, McDermott C, Chess-Williams R. (2021) Chloroacetaldehyde , the toxic metabolite of cyclophosphamide, alters urinary bladder function. Abstract 204. Abstract available at: https://az659834.vo.msecnd.net/eventsairseasiaprod/production-expertevents-public/b1a975583c4d4ba8aff8c8f0b06e5339

West EJ, Sellers DJ, McDermott C, Chess-Williams R. (2021) Multiple treatments with cyclophosphamide cause physiological changes to the murine urinary bladder. Abstract 499. Abstract available at: https://az659834.vo.msecnd.net/eventsairseasiaprod/production-expertevents-public/b186f1c07bf84a64b397af39c0aeba95

Nilsson D, Chess-Williams R, Sellers DJ. (2021) Potentiating effect of tadalafil and sildenafil on vasodilation of the porcine superior vesical artery. Abstract 497. Abstract available at: https://az659834.vo.msecnd.net/eventsairseasiaprod/production-expertevents-public/b186f1c07bf84a64b397af39c0aeba95

Australian Physiological Society (Gold Coast)

Phelps C, Chess-Williams R, Moro C. (2021) Identifying novel mediators of contraction within the urinary bladder urothelium and lamina propria tissue layers. Abstract available at http://aups.org.au/Meetings/202011/images/2021_AuPS_AbstractBooklet.pdf

Moro, C. and Phelps, C (2021) Equally engaging both face to face and online students during live lectures with interactive polling. Abstract available at: http://aups.org.au/Meetings/202011/images/2021_AuPS_AbstractBooklet.pdf

British Physiological Society (online)

Phelps, C., Chess-Williams, R., & Moro, C. (2021, July). Potential targets for underactive bladder treatments: Receptor-mediated contractions of the urinary bladder urothelium. Physiology 2021. United Kingdom, virtual conference. Abstract available at https://www.physoc.org/abstracts/potential-targets-for-underactive-bladder-treatmentsreceptor- mediated-contractions-of-the-urinary-bladder-urothelium/

National Conference on Incontinence (NCOI)

West E, McDermott C, Sellers DJ, Chess-Williams R (2021) Multiple treatments with the cytotoxic drug cyclophosphamide alters voiding behaviour and bladder physiology. ANZ Continence Journal

National Symposium on Advances in Urogenital and Gut Research (online)

Phelps, C., Chess-Williams, R., & Moro, C. (2021, October). Novel targets for the pharmaceutical management of bladder contractile disorders: Identifying mediators of contraction in the urinary bladder urothelium. ASCEPT Special Interest Group Virtual National Symposium on Advances in Urogenital and Gastrointestinal Research.

RACI Chemical Education Division Symposium

Tauber, A. L., Schweiker, S. S., & Levonis, S. M. (2021, July). The Design, Application and Evaluation of a Gamified Virtual Laboratory to Aid in Distance Learning-Chemistry Education. In 2021 RACI Chemical Education Division Symposium: Assessment, Feedback and Online Innovations: Where to Next?.

APPENDIX 1: TECHNIQUES USED IN OUR LABORATORIES

- Cyclophosphamide model of bladder inflammation.
- Streptozotocin model of type 1 diabetes mellitus
- Voiding pattern analysis in vivo (yields frequency and volume of bladder emptying)
- Isolated tissue bath techniques (obtains contractile and secretion responses to drugs and nerve stimulation).
- Isolated whole bladder preparation (measures bladder compliance, contraction, responses to nerve stimulation, accommodation to large volumes, mediator release into the lumen, etc)
- Cell culture of human prostate (PC3, LNCap) and bladder (RT4, T24) cancer cell lines. Assays for markers of inflammation, apoptosis, autophagy. Measurements of cell survival after treatments, cell motility, release of transmitters (ATP, Ach, PGE2), etc.
- Isolated blood vessel function (with & without endothelium)
- Several different models of psychological stress in rodents (water avoidance, social defeat, witness trauma)
- Afferent (sensory) nerve recording during drug administration or bladder filling.
- Flow cytometry and immunohistochemistry
- Computational chemistry applied to synthetic design for biological application
- Single-step and multi- step organic synthesis for the development of novel therapeutic lead compounds
- HPLC analysis to determine cell-surface sialylation
- Flow cytometry with lectin characterisation to specify glycan linkages in treated human cell lines
- Novel compound purification and characterisation using nuclear magnetic resonance spectroscopy and mass spectrometry.
- Poly ADP ribose polymerase (PARP) inhibitor assays
- Neurophotonics

APPENDIX 2 – ADVISORY GROUP TERMS OF REFERENCE

Faculty Centre for Urology Research

Advisory Group

Terms of Reference

FUNCTION

The Centre for Urology Research (CUR) is a Faculty, multidisciplinary, research group that represents all members of staff and students with an interest in the lower urinary tract or pelvic conditions such as erectile dysfunction and faecal incontinence. The Centre Director reports to the Executive Dean, Faculty of Health Sciences & Medicine, Bond University.

MISSION STATEMENT

To enhance our knowledge of the lower urinary tract with the aim of developing new treatments or enhancing current treatments of the following conditions:

- Overactive and underactive bladder
- Prostate and bladder cancers
- Stress incontinence
- Benign prostatic hyperplasia
- Interstitial cystitis
- Erectile dysfunction
- Faecal incontinence

VISION

A worldwide reputation for excellence in the field of academic urology, the Centre known for identifying novel targets for drug development.

MEMBERSHIP

(i) **Chair**: Director, Centre for Urology Research

(ii) **External Advisors**:

Dirk van Helden (University of Newcastle)

NHMRC Principal Research Fellow & Brawn Senior Fellow (retired)

Rowan Cockerell (CEO, Continence Foundation of Australia)

(iii) **Executive Committee Members**: Senior academic staff of CUR (Full and Associate Professors), Associate Dean of Research, HSM and external partners.

TERMS OF REFERENCE

1. Contribute to the development and review of the Centre's strategic plan.
2. Provide strategic advice on the direction of research projects and their alignment with national trends and industry needs.
3. Advise on sources of future funding, partnerships and collaborations.
4. Where required, assist with problems arising (eg. how to increase patient participation in our decision making).

SCHEDULE FOR MEETINGS

The Advisory Group will meet twice a year in 2022.