

MOHSIN SARWAR

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PERSONAL STATEMENT

I am a molecular pharmacologist with over 10 years of research experience including more than 3 years of industry experience. I am currently working as a research fellow at Monash University where I am the head of in vitro pharmacology working on several drug discovery industry projects in collaboration with Servier (France). I am a highly trained pharmacologist with a great deal of experience in cell signalling, assay development, high throughput screening and molecular pharmacology aiming to solidify my career in academia.

EDUCATION

2011 – 2015 Doctor of Philosophy (Ph.D.): Pharmacology and Pharmaceutical Sciences
Monash Institute of Pharmaceutical Sciences, Monash University
2005 – 2008 Bachelor of Biomedical Sciences (First Class Honours)
Department of Pharmacology, Monash University

HONOURS AND AWARDS

2017 Awarded Editors' Choice for my article published in British Journal of Pharmacology
2015 Awarded Relaxin2015 International Travel Award
2015 Awarded the British Pharmacological Society International Travel Award
2011 – 2015 Awarded Ph.D. Scholarship (Monash University)
2013 Finalist for ASCEPT Neville Percy prize
Finalist for ASCEPT Cardiovascular SIG Prize
2012 Awarded Howard Florey Institute Travel Award (Melbourne University)
2011 Winner of SOBS and ARMI 3-minute thesis competition (Monash University)
Finalist for Faculty of Medicine, Nursing and Health Sciences (Monash University)
2007/2008 Awarded summer scholarship (Monash University)

ACADEMIC & RESEARCH QUALIFICATIONS

Doctorate (Ph.D.) **Mar 2011 – May 2015**

Monash Institute of Pharmaceutical Sciences, Monash University

A PhD candidate in the Drug Discovery Biology laboratory to understand the cellular and molecular mechanisms of action of relaxin, a peptide in late Phase III clinical trials for the treatment of acute heart failure.

Thesis title: The mechanisms of action of relaxin in the human cardiovascular system

First Class Honours

Mar – Nov 2008

Department of Pharmacology, Monash University

An honours student in the laboratory of Prof Roger Summers to delineate ligand-bias using several clinically used β -blockers for the treatment of heart failure.

Thesis title: Ligand-directed signalling bias at the human β_3 -adrenoceptor by β -adrenoceptor antagonists

EMPLOYMENT HISTORY

Research Fellow

July 2015 – Present

Monash University & Servier Laboratories

Head of *in vitro* pharmacology working on a range of G protein-coupled receptor (GPCR) drug discovery industry projects in collaboration with Servier Laboratories (France) to develop novel therapeutics for neuropsychiatric and metabolic disorders.

- Conducted routine primary screen to evaluate structure activity relationships of hit compounds
- Developed and performed cell-based signalling assays in recombinant and primary neuronal cultures to support medicinal chemistry screening program
- Used pharmacology tools and skills to perform mechanistic studies in recombinant cells and primary neurons to describe mechanism of action of novel GPCR targets
- Performed secondary screening of hit compounds in neurons to validate compound activity
- Performed receptor knockdown studies using shRNA to determine specificity of hit compounds in neurons

- Utilised brain slices to understand physiological signalling of neurons using confocal and two-photon microscopy
- Investigated GPCR localisation and function in specific cellular organelles using confocal microscopy
- Developed robust HTS-compatible assays to identify specific GPCR antagonists to investigate potential efficacy for neurological disorders
- Developed a robust assay for a high-throughput screening campaign of ~120K compounds followed by performing validation studies to determine specificity
- Analysed and reported data in a timely fashion including reporting to project team(s), archiving and presentation at laboratory meetings
- Provided operational and strategic level support to build and manage research agenda
- Collaborated with multiple groups specialising in drug pharmacokinetics, medicinal chemistry, biochemists and *in vivo* biologists to progress discovery projects
- Independently planned, executed and successfully completed side projects to assist in understanding of GPCR pharmacology to assist in decision making of research agenda
- Supervision of undergraduate, honours and postgraduate students to assist in side projects

Research Associate

Jan 2009 – Mar 2011

Monash Institute of Pharmaceutical Sciences & Department of Pharmacology, Monash University

An associate in the Drug Discovery Biology group investigating stimulus bias using several clinically used β -blockers for the treatment of heart failure.

- Evaluated ligand affinity and receptor expression using several different techniques
- Screened clinically used β -blockers to evaluate signalling bias using second messenger signalling assays and reporter gene assays
- Utilised pharmacological tools to delineate mechanism of action of β -blockers
- Analysed and presented data in a timely fashion to fellow team members, laboratory members and to department members
- Prepared manuscripts for publication

SUPERVISION

Undergraduate	4
Honours	1
Doctoral Candidates	1
Postdoctoral	1

PUBLICATIONS

Published

1. Kocan M*, **Sarwar M***, Samuel CS, Bathgate RAD, Agoulnik A & Summers RJ. (2015) ML290 is a biased agonist acting at the allosteric activation site of RXFP1. *Scientific Reports*. 7(1):2968. (*Co-first authors).
2. **Sarwar M**, Du X-J, Dschietzig T & Summers RJ. (2016) Relaxin actions on the human cardiovascular system. *Br J Pharmacol*. 174(10):933-949.
3. **Sarwar M**, Samuel CS, Bathgate RAD, Stewart D & Summers RJ. (2015) Enhanced serelaxin signalling in co-cultures of human primary endothelial and smooth muscle cells. *Br J Pharmacol*. 173(3):484-96.
4. **Sarwar M**, Samuel CS, Bathgate RAD, Stewart D & Summers RJ. (2015) Serelaxin-mediated signal transduction in human vascular cells: bell-shaped concentration response curves reflect differential coupling to G-proteins. *Br J Pharmacol*. 172(4):1005-19.
5. Ryan P, Krstew E, **Sarwar M**, Gundlach A & Lawrence A. (2014) Relaxin-3 mRNA levels in nucleus incertus correlate with alcohol and sucrose intake in rats. *Drug Alcohol Depend*. 140:8-16.
6. Kocan M, **Sarwar M**, Hossain A, Wade JD & Summers RJ. (2014) Signalling profiles of H3 relaxin, H2 relaxin and the novel antagonist R3(B Δ 23-27)R/I5 acting at the relaxin family peptide receptor 3 (RXFP3). *Br J Pharmacol*. 171(11):2827-41.
7. Chow BSM, Kocan M, Bosnyak S, **Sarwar M**, Jones ES, Widdop RE, Summers RJ, Bathgate RAD, Hewitson TD & Samuel CS. (2014) Relaxin Abrogates the Influence of TGF- β on Renal Fibrosis via the Angiotensin II Type 2 (AT2) Receptor. *Kidney International*. 86(1):75-85.
8. Xu Q, Dalic A, Fang L, Kiriazis H, Ritchie RH, Sim K, Gao X-M, Drummond G, **Sarwar M**, Zhang Y-Y, Dart AM, Du X-J. (2011) Myocardial oxidative stress contributes to transgenic β_2 -adrenoceptor activation-induced cardiomyopathy and heart failure. *Br J Pharmacol*. 162(5):1012-28.
9. Evans BA, Sato M, **Sarwar M**, Hutchinson DS, Summers RJ. (2010) Ligand-directed signalling at β -adrenoceptors. *Br J Pharmacol*. 159(5):1022-38.

Under Preparation

1. Stewart G, **Sarwar M**, Langmead CJ. (2018) Orphan GPCRs in Schizophrenia & cognition (Under preparation).
2. **Sarwar M**, Tao J, Liu J, Stewart G, Langmead CJ. (2018) Stereochemical ligand bias at the orphan receptor GPR88 (Under preparation).
3. Tao J, **Sarwar M**, Ang S, Stewart G, Langmead CJ. (2018) Identification of functional domains of GPR88 (Under preparation).

TEACHING EXPERIENCE

Student Supervisor

Aug – Oct 2017

Monash Institute of Pharmaceutical Sciences, Monash University

A project supervisor of 3rd year student for PSC3332 (Drug Discovery Biology Research Project)

- Provided adequate training to students with no prior research experience including ascetic culture techniques, *in vitro* pharmacology and cell signalling assays
- Aided in the analysis of data and data presentation for different audiences
- Developed written and oral communication skills of the student to present in front of different audiences
- Explained novel concepts to students in an easy-to-understand manner
- Provided adequate training to student to become self-reliant by aiding in the planning and organisation of the project
- Provided counselling and career advice to students to help guide student to their desired career pathway
- Provided timely feedback on data, reports and presentations

Teaching Associate

Jul – Oct 2013

Monash Institute of Pharmaceutical Sciences, Monash University

A teaching Associate of 2nd and 3rd year pharmacy students in the following subjects: PSC2332 & PSC3042 (Disease focused pharmacology) and PSC2012 (Pharmacology)

- Communicated with students in a comprehensible and friendly manner
- Undertook student practical classes, mini-lectures and small group learning tasks
- Aided in the understanding of difficult concepts using diagrams, animations and lay language
- Provided timely feedback to students on reports and assignments

Student Mentor

Jun – Oct 2012

Monash Institute of Pharmaceutical Sciences, Monash University

Mentor of 3rd year pharmacy student for PAC3512 (Current Aspects of Pharmaceutical Research)

- Provided adequate training to students to perform literature searches and collect data from different databases including Pubmed, Scopus and Uniprot
- Developed written communication skills of the student to write literature reviews for different audiences
- Explained novel concepts to the student in an easy-to-understand manner by using diagrams and lay language
- Provided adequate training to student to become independent by aiding in the planning and organisation of the project
- Provided counselling and career advice to the student
- Provided timely feedback on reports and presentations

ORAL/SEMINAR PRESENTATIONS

1. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Mechanism of action of relaxin in the human cardiovascular system. PhD Seminar. 2015, Mar 6th, Melbourne, Australia.
2. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Serelaxin signalling in human primary vascular cells: G-proteins and their location determines the shape of the concentration-response relationship. ASCEPT-MPGPCR 2014, Dec 7th – 11th, Melbourne, Australia.
3. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Mechanisms of actions of serelaxin in human vascular cells. Neuropeptides Division Meeting; 8th July 2014, Florey Neurosciences Institute, University of Melbourne, Melbourne, Australia.
4. **M. Sarwar**, CS Samuel & RJ Summers. Relaxin' the blood vessels: signal transduction mechanisms of serelaxin in human vascular cells. ASCEPT 2013, Dec 1st-4th, Melbourne, Australia.
5. **M Sarwar**, CS Samuel & RJ Summers. Mechanisms of actions of serelaxin in human vascular cells highlight the potential role of the venous circulation. 1st Annual Drug Discovery Biology Student Symposium; Oct/Nov 2013; Monash Institute of Pharmaceutical Sciences, Monash University, Melbourne, Australia.

6. **M Sarwar**, CS Samuel & RJ Summers. Mechanisms of actions of serelaxin in the human vascular system. Neuropeptides Division Meeting; Sep 2013, Florey Neurosciences Institute, University of Melbourne, Melbourne, Australia.
7. **M Sarwar**, CS Samuel & RJ Summers. Signal transduction mechanisms mediated by relaxin in human vascular cells. 6th International Conference on Relaxin and Related Peptides. Oct 2012; Florence, Italy.
8. **M Sarwar**, CS Samuel & RJ Summers. Signal transduction mechanisms utilised by relaxin in human vascular cells. 7th Annual Postgraduate Research Symposium, Monash University; Sep 2012; Melbourne, Australia.
9. **M Sarwar**, DS Hutchinson, M Sato & RJ Summers. Ligand directed signalling at the human β_3 -adrenoceptor. Department of Pharmacology, Monash University; Sep 2008; Melbourne, Australia.

INVITED SEMINARS

1. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Mechanism of action of relaxin in the human cardiovascular system. Lahore University of Management Sciences. Mar 15th 2017. Lahore, Pakistan.
2. **M Sarwar**. Promoting collaborations between industry and academia. University of Sargodha. Mar 21st 2017. Sargodha, Pakistan.
3. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Serelaxin signalling in human primary vascular cells. 7th International Conference on Relaxin and Related Peptides. 23rd September 2015; Kuching, Malaysia.
4. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Signal transduction mechanisms of serelaxin in human primary vascular cells. Lahore University of Management Sciences. 30th October 2014, Lahore, Pakistan.
5. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Mechanisms of actions of serelaxin in human vascular cells. GPCR Forum, Monash Institute of Pharmaceutical Sciences, 7th August, 2014, Melbourne, Australia.

ABSTRACT/POSTER PRESENTATIONS

1. Gregory D Stewart, Sanja Bosnyak, **Mohsin Sarwar**, Miaomiao Mao, David Spanswick, Anne-Marie Chollet, Clotilde Mannoury La Cour, Christopher J Langmead. GPR88 is a key regulator of striatal function. ASCEPT-MPGPCR Joint Scientific Meeting. 27–30 November 2016; Melbourne, Australia
2. Martina Kocan, **Mohsin Sarwar**, Sheng Y. Ang, Jingbo Xiao, Juan J. Marugan, Mohammed A. Hossain, Chao Wang, Dana Hutchinson, Chrisan S. Samuel, Alexander I. Agoulnik, Ross A.D. Bathgate, Roger J. Summers. ML290 is a small molecule biased agonist at relaxin family peptide receptor 1 (RXFP1). ASCEPT-MPGPCR Joint Scientific Meeting. 27–30 November 2016; Melbourne, Australia
3. **Mohsin Sarwar**, Chrisan S Samuel, Ross AD Bathgate & Roger J Summers. Serelaxin signalling in human primary vascular cells. 7th International Conference on Relaxin and Related Peptides. 23rd September 2015; Kuching, Malaysia.
4. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Serelaxin signalling in human primary vascular cells: G-proteins and their location determine the shape of the concentration-response relationship. ASCEPT-MPGPCR 2014, Dec 7th – 11th, Melbourne, Australia
5. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Endothelium-dependent cAMP and cGMP responses to serelaxin in human smooth muscle cells: role of nitric oxide and prostanoids. ASCEPT-MPGPCR 2014, Dec 7th – 11th, Melbourne, Australia
6. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. Distinct signalling profiles produced by serelaxin in human vascular cells. 17th World Congress of Basic and Clinical Pharmacology (WCP2014). 13th – 18th July 2014. Cape Town, South Africa
7. CS. Samuel, BSM Chow, M Kocan, **M Sarwar**, RJ Summers, RE Widdop, RAD Bathgate, TD Hewitson. Mechanisms of the anti-fibrotic actions of serelaxin. Satellite Meeting of the World Congress of Cardiology 2014. 4th – 7th May 2014, Melbourne Australia
8. **M Sarwar**, CS Samuel, RAD Bathgate & RJ Summers. The characteristic signalling profiles produced by serelaxin in human vascular cells. 5th Focused Meeting on Cell Signalling. 28th -29th April 2014. Leicester, UK.
9. **M Sarwar**, CS Samuel & RJ Summers. Serelaxin treatment causes characteristic signalling profiles and changes in gene expression in human vascular cells. ASCEPT 2013, Dec 1st-4th, Melbourne, Australia
10. **M Sarwar**, CS Samuel & RJ Summers. Signal transduction mechanisms utilised by relaxin in human vascular cells. MPGPCR 2012; Dec 2012; Melbourne, Australia
11. **M Sarwar**, CS Samuel & RJ Summers. Relaxin signal transduction mechanisms in human vascular cells. MPGPCR 2010; Dec 2010; Melbourne, Australia
12. D Hutchinson, **M Sarwar**, E Stancic, M Sato, B Evans, R Summers. Ligand-directed signalling by β -adrenoceptor antagonists at the human β_1 - and β_3 -adrenoceptors. XIth World Conference of Basic and Clinical Pharmacology 2010: WorldPharma2010; July 2010; Copenhagen, Denmark
13. **M Sarwar**, DS Hutchinson, M Sato & RJ Summers. Ligand directed signalling at the human β_3 -adrenoceptor. MPGPCR 2008; Nov 2008; Sydney, Australia

SKILLS

Scientific Skills

- Culturing of cells and tissues
 - Immortalised cell lines (HEK, CHO)
 - Primary cells (endothelial cells, smooth muscle cells, fibroblasts, neurons)
 - Co-culturing of primary cells (endothelial cells, smooth muscle cells, fibroblast)
 - Organotypic cultures of brain slices
- Radiolabelling of peptides (Chloramine-T and Bolton-Hunter reagents)
- Radioligand binding assays
 - Iodination of peptides (Chloramine-T and Bolton-Hunter reagents)
 - Competition, saturation, association and dissociation radioligand binding assays
 - GTP γ ³⁵S binding assays
- Gene expression
 - Reverse transcription–polymerase chain reaction (RT-PCR)
 - Real time–PCR (qPCR)
- Signalling assays
 - Second messenger assays (cAMP & cGMP assays)
 - MAPK signalling (ERK1/2 phosphorylation, p-38MAPK phosphorylation, JNK1/2/3 phosphorylation, AKT1/2 phosphorylation)
 - AlphaScreen assays (cAMP, cGMP, ERK1/2 phosphorylation, p-38MAPK phosphorylation, JNK1/2/3 phosphorylation, AKT1/2 phosphorylation)
 - Intracellular calcium mobilization assay (Fluo-4-AM detection)
 - Reporter gene assays (CRE, AP1, NFkB and SRE)
- Protein Expression and activity
 - Western blotting (Fluorescence, Film development)
 - Zymography (gelatin)
 - Flow cytometry
 - ELISA assays
- Microscopy
 - INCell, Confocal, Two-Photon
- Organ bath assays

IT Skills

- Extensive experience with Microsoft Office, GraphPad Prism and Adobe illustrator

Languages

- Fluent in Urdu, Punjabi, Hindi and English

PROFESSIONAL ACTIVITIES

Professional memberships

1. Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists **2010 – Present**
2. British Pharmacological Society **2013 – Present**

Workshops

1. Cortellis workshop. 8th Feb 2018, Melbourne, Australia
2. 'Introduction to pedagogy and small group teaching' by Igor Mitrovic. 4th September 2013, Melbourne, Australia
3. Molecular Modelling of G-Protein Receptors symposium. 1st December 2010, Melbourne, Australia

COMMUNITY ENGAGEMENT

Peer reviewer

Clinical and Experimental Pharmacology and Physiology
Cellular Signalling

Jun 2017 – Present
Nov 2017 – Present

Volunteer Teacher

Al-Asr Education System, Pakistan

A volunteer teacher in a rural school in Gujrat (Pakistan) where I taught English, Maths and Science to primary and high school students.

Dec 2011 – Jan 2012