

New Zealand-Australian Controlled Release Society 2017 Joint Workshop

Thakur SS^{1,2}, Agarwal P¹, Wu Z²

¹Buchanan Ocular Therapeutics Unit, Department of Ophthalmology, New Zealand National Eye Centre, Faculty of Medical and Health Sciences, University of Auckland, New Zealand. ²School of Pharmacy, Faculty of Medical and Health Sciences, University of Auckland, New Zealand.

The New Zealand-Australian Controlled Release Society (CRS) 2017 Joint Workshop was held at the Grafton Campus of the University of Auckland, New Zealand, on 22-23 November, 2017. The workshop followed the theme *Recent Trends in In-vitro, Ex-vivo and In-vivo Models in Bioactive Delivery*, and was a three-way initiative between the New Zealand and Australian Chapters of the Controlled Release Society (CRS) along with the Otago D4 Network. Eighty-three representatives (Figure 1) from pharmaceutical companies and universities across the Asia-Pacific region (New Zealand, Australia, USA, Malaysia and China) attended the workshop, which featured twenty-two speakers with diverse research interests and backgrounds. Proceedings containing abstracts and biographies from the invited speakers and the eight students participating in the student session were provided to the attendees.



Figure 1: Attendees of New Zealand-Australian CRS 2017 Joint Workshop from pharmaceutical companies and universities across the Asia-Pacific region (New Zealand, Australia, USA, Malaysia and China).

The workshop started with a warm welcome from New Zealand CRS president, Dr Zimei Wu (University of Auckland, NZ).

The first session was then commenced with a keynote lecture by Professor Kinam Park (Purdue University, USA), a Past President of CRS, which highlighted the limitations of currently used animal models and caution that needs to be exercised while interpreting bioefficacy and toxicity data attained from these. Professor Park expanded beyond animal models and also discussed incapacibilities of emerging lab-on-a-chip models as well as limitations from human data due to large inter-individual variations in response to therapeutics. The thought provoking lecture was very highly regarded by the audience. The session concluded with associate Professor Jingyuan Wen (University of Auckland, NZ) showcasing the oral delivery of protein and peptide drugs and detailing how their efficacy may be assessed using *in vitro* and *in vivo* models.

After a morning tea break which was designed to allow audience to interact, the second session was headlined by Professor Ian Tucker (University of Otago, NZ, also a Past President of CRS) who introduced attendees to the complementary application of *in vitro*, *in vivo* and mathematical models for optimisation of drug delivery systems to treat bovine mastitis. Professor Tucker's talk emphasised the importance of using appropriate *in vitro* tests to screen for the most suitable formulations to proceed to the *in vivo* setting. Next, Dr Peter Surman (Douglas Pharmaceuticals, NZ) elaborated on drug repurposing strategies being utilised in industry, after which Dr Zimei Wu (University of Auckland, NZ) offered insight into biocompatibility evaluations for injectable products. The session was concluded with talks from Distinguished Professor Bill Denny and Dr Stephen Jamieson of the Auckland Cancer Society Research Centre (University of Auckland, NZ), both of whom discussed the testing of hypoxia-activated prodrugs using *in vitro* and *in vivo* tumour models.

Lunch was followed by talks from Professor Shugeng Cao (University of Hawaii, USA) whose laboratory is developing paclitaxel-bound gold nanoparticles for tumour targeting, and Professor Simon Moulton (Swinburne University of Technology, Australia) who presented a technique to load polymeric fibres with gemcitabine for localised drug delivery to pancreatic tumours. The first day of the workshop ended with the student session, wherein PhD students from universities around New Zealand showcased their research in a three-minute presentation format.

Professor Ben Boyd (Monash University, Australia) kicked off the second day with a presentation on the use of an *in vitro* synchrotron-based scattering approach to predict how poorly water soluble and permeable drugs would behave *in vivo*. Dr Darren Svirskis (University of Auckland, NZ) followed with learnings from his collaborations with clinicians, using his project on characterising human peritoneal fluid for drug delivery research as the background for his talk. Next, Dr Amirali Popat (University of Queensland, Australia) reflected on how tuning the size and morphology of mesoporous silica nanoparticles developed by his research group can allow selective accumulation in the intestinal mucosa. Dr Christopher Hall (University of Auckland, NZ) completed the session, demonstrating the use of a zebrafish embryo model to study inflammatory disease and targeted delivery of anti-inflammatory drugs in collaboration with School of Pharmacy.

Morning tea was followed by Professor Mohd Cairul Iqbal Mohd Amin (National University of Malaysia, President of Malaysia Local CRS Chapter) addressing the use of a bacterial cellulose based hydrogel as a biomaterial for wound healing. The gel accelerates full thickness wound healing on its own, and can additionally function as a cell carrier that delivers human epidermal keratinocytes and

dermal fibroblasts to the site of injury to accelerate wound healing even further. Next Dr Manisha Sharma (University of Auckland, NZ) reviewed an *in situ* gel developed by her group to sustain delivery of anaesthetic to synovium and contrasted findings between *in vitro* models and *ex vivo* human knees. This presentation was followed by Drs Ilva Rupenthal and Sachin Thakur (University of Auckland, NZ) who discussed strengths and limitations of currently utilised laboratory based models for ocular drug delivery evaluations. Models of both the anterior and posterior eye developed by their research group were accentuated. Dr Shyamal Das (University of Otago, NZ) closed the session by shedding light on limitations of current models for respiratory drug delivery systems. At present, no animal model is available to suitably predict pharmacokinetics of inhaled substances, and impactors remain the gold standard *in vitro* assay for respiratory devices.

In the final session of the workshop, Associate Professor Joshua Reineke (South Dakota State University, USA, Past President of Young Scientist CRS) introduced the concept of particokinetics; models and methods devised to better understand nanoparticle biodistribution and dynamic changes in properties such as particle degradation and drug liberation. Various tissue specific assays were discussed. Dr Reineke's talk stimulated an engaging discussion on the perspective of nanomedicine with Professor Kinam Park and the audience. Dr Travis Badenhorst (Snowberry, NZ) then showed the value of *in vitro* studies in identifying mechanisms of nanovesicle uptake into dermal cells, and explained how these inform delivery system design for cosmetic applications. Dr Sara Hanning (University of Auckland, NZ) was the final speaker of the workshop, and addressed the current limitations in designing clinical trials for translation of paediatric formulations from bench to bedside. Practical considerations for maintaining the integrity of a double-blinded study design were highlighted.

At the end of the session, Dr Zimei Wu acknowledged Dr Darren Svirskis, Associate Professor Jingyuan Wen and the enthusiastic PhD students of the Auckland School of Pharmacy who helped with the organisation of this event. She additionally highlighted that Professor Kinam Park was awarded the prestigious 2017 Vice Chancellor's Distinguished Visitor Award from the University of Auckland, for which he gave a number of seminars before and after the workshop.

The meeting concluded with a prize giving ceremony for the student three-minute presentations. Mr Mohammad Momin from the University of Otago was awarded the first prize, with Ms Jingjunjiao Long (Auckland University of Technology) and Ms Priyanka Agarwal (University of Auckland) being awarded the first and second runner-up prizes, respectively.

The two-day workshop brought many opportunities for people to mingle and discuss collaborations and future research, and was clearly well-received by all in attendance. We hope to offer more such joint regional CRS initiatives in the future.



Photos at the Reception on day one



Photos taken during the workshop.



Photos during the tea /lunch breaks.



The Auckland School of Pharmacy staff welcome the external and overseas speakers.

Photographer: Mr Marvin Tang (PhD student, University of Auckland)