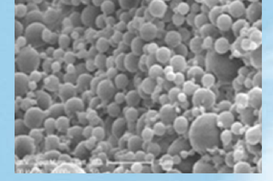
Formulation and Drug Delivery Research Theme

School of Pharmacy, the University of Auckland, Auckland, New Zealand.



School of Pharmacy - The University of Auckland

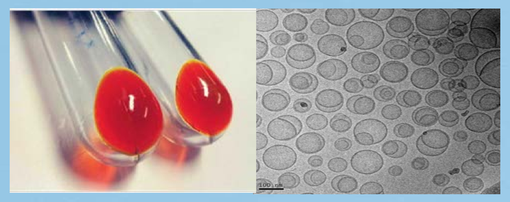
The Drug Delivery Systems Research theme focuses on turning bioactive molecules into medicines ready for administration. A vast range of medicines are available; however, treatment success in patients hinges on appropriate control over the **timing, extent and location of dosing**. Innovative delivery strategies are required for existing drugs to optimise therapeutic outcomes. Meanwhile, the promise of new bioactive molecules is often challenged due to poor absorption or severe side effects. This research theme aims to improve the therapeutic effectiveness of both existing and new medicines through the development of various medicine formulations. We often work in partnership with key research centers, hospitals and industry. This research theme lends itself to investigations and problem-solving in a wide range of areas. Four representative areas are described below :

1) The majority of anti-cancer drugs are harmful to both cancerous cells and healthy cells. Tumour-targeted drug delivery involves packaging an anti-cancer molecule inside nano-sized carriers which targets the treatment directly to the cancer cells and reduce side effects.

2) Conventional dosage forms are associated with many problems including poor bioavailability, non-specificity, rapid metabolism and excretion, these can be solved through pharmaceutical nanotechnology. Many drugs such as paclitaxel, acyclovir, antimalarial and others formulated into nanoparticles have shown improved efficacy and safety over conventional dosage forms.

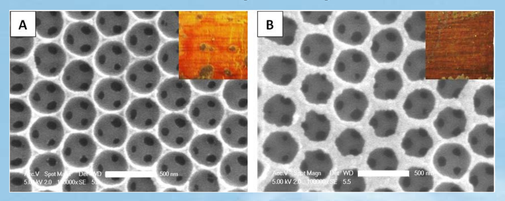
3) Many medicines need to be taken once or multiple times every day, they are non-specifically transported from the site of administration to the site of action. Oral, ocular or implantable delivery systems have the capacity to release drug over weeks to months or to localized sites in the body. These technologies are being further extended through stimuli-responsive platforms where doses can released when they are required.

4) Neuropeptide delivery for the treatment of neurological conditions. Targeting the delivery of therapeutic compounds across the blood brain barrier (BBB) presents great challenges for the global scientific community. Our experts have patented advanced technologies enabling the delivery of the neuropeptides across the BBB.

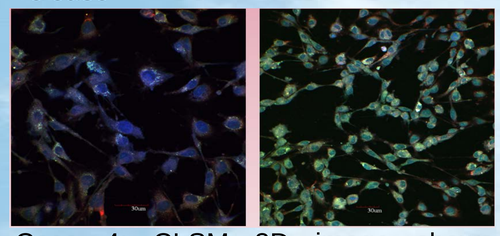


Case 1: Nano-liposomes with high drug content allowing insoluble drug given by i.v. without irritation to the vein.

Case 2: Nanoparticles have improved ocular bioavailability of acyclovir.



Case 3: Stimuli responsive conducting polymer platform for triggered drug release.



Case 4: CLSM 3D image shows cellular untake by RBMVECs (BBB) after incubation with drug loaded FITC nanoparticles at 37ºC for 1 h (L) and 4 h (R).

A/Professor Jingyuan Wen is the theme leader with research interests in delivery of human and veterinary products. Her special research focuses using advanced delivery systems to enhance oral bioavailability for protein and peptide drugs and also enhance drug penetration cross BBB and the skin barrier to deliver neuropeptide or other bioactives. She is also an expert for complementary medicine and nutraceutical science.
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Dr Zimei Wu's expertise includes pre-formulation, cell culture and pharmacokinetics which underpins her major research activities in the design of drug delivery systems for improving "biocompatibility", "prevention of post-injection drug precipitation" and particularly 'tumour-targeted delivery'. She also researches dermal/transdermal delivery in collaboration with local pharmaceutical companies.
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Dr Raida Al-Kassas is an expert in nanotechnology with international reputation in this field. She has extensive research experience focused on the use of multiparticulate systems including microspheres and nanoparticles for administration of drug substances and anti-bacterial agents. She has been working on improving the safety and efficacy of drugs using nanotechnology for many years.
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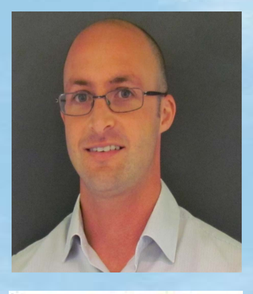

Dr Darren Svirskis has research interests in implantable biomaterials, with both biodegradable and non-biodegradable drug delivery systems formulated with release profiles designed to match clinical requirements. Darren has a special focus using Conducting Polymer platforms to achieve on-demand, electrically tunable release.
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Dr Manisha Sharma has research interests in the development and evaluation of polymeric implantable drug delivery systems including both biodegradable and non-biodegradable systems to address the current clinical conditions. She is also interested in stimuli responsive delivery systems based on thermoresponsive and intrinsically conducting polymers.
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