

CURRICULUM VITAE, PUBLICATIONS AND OTHER PUBLISHED WORKS

PART 1

| 1a. Personal details | | | | |
|-----------------------|--|--|-----------------------|--------------------|
| Full name | <i>Title</i> | <i>First name</i> | <i>Second name(s)</i> | <i>Family name</i> |
| | Dr | Zimei | | Wu |
| Present position | | Associate Professor in Pharmaceutical Sciences | | |
| Organisation/Employer | | The University of Auckland (UoA) | | |
| Contact Address | School of Pharmacy, The University of Auckland | | | |
| | Private Bag 92019, Auckland Mail Centre | | | |
| | Auckland, New Zealand | | Post code | 1142 |
| Work telephone | 0064 9 9231709 | Mobile | 027 3235 151 | |
| Email | z.wu@auckland.ac.nz | | | |
| Personal website | https://unidirectory.auckland.ac.nz/profile/z-wu | | | |

1b. Academic qualifications

2005 University of Otago, PhD, Pharmaceutical Sciences (Drug Delivery)
 1999 China Pharmaceutical University. MSc
 1989 Shandong Medical University, China. BPharm.

1c. Professional positions held

2017- Associate Professor of Pharmaceutical Sciences, School of Pharmacy, UoA
 2012-2017 Senior Lecturer, School of Pharmacy, UoA
 2009-2011 Lecturer of Pharmaceutics, School of Pharmacy, UoA
 2006-2009 Senior/Research Scientist, NZ Bayer at University of Otago
 2002-2005 PhD candidate, School of Pharmacy, University of Otago
 2000-2002 Junior Research Fellow, School of Pharmacy, University of Otago
 1999-1999 Visiting Scholar from China Pharmaceutical University at Uni of Otago

1d. Present research/professional speciality

I undertake research studies in all aspects of drug delivery development, from physicochemical characterisation, cell culture, to pharmacokinetics and pharmaceutical analysis which underpins my major research activities in the design of drug delivery systems to improve drug safety and efficacy. My first patent (1997) was on a mould for extemporaneous preparation of hollow-type suppositories. My PhD research focused on injectable formulation, focusing on developing strategies to prevent *in vivo* drug precipitation and tissue irritation. My research at UoA has focused on the design of novel drug delivery systems, particularly 'smart' liposomes to improve 'drugability' and therapeutic outcomes of anticancer agents.

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| 1e. Total years research experience | 22 years |
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1f. Professional distinctions and memberships (including honours, prizes, scholarships, boards or governance roles, etc)

MEMBERSHIP AND SERVICE

2015-2017 President, NZ Local Chapter of **CRS** Committee (Vice President 2012-15)
 2010-2013 Committee member, Young Scientist Committee of Global CRS*.

Member of: i) Global CRS since 2010; ii) American Association of Pharmaceutical Scientists iii) Auckland Cancer Research Network. *CRS (Controlled Release Society) is the premier society worldwide for members to participate in important activities to advance drug delivery science and technology.

PRIZE AND SCHOLARSHIP

2009 NZ-China Scientists Exchange Award. The Royal Society of New Zealand.
 2002 Technology for Industry Fellowship (for PhD research), NZFRST

RESEARCH GRANTS as Principal Investigator;

2017 University Distinguished Visitor Award (visitor: Prof Kinam Park of Purdue University)
2016 Intracellular delivery to overcome drug resistance. School of Pharmacy UoA. **\$25,000**
2016 Peptide stability study. Industry research project. **\$113,313**
2015 In vitro evaluation of an active targeting liposomal delivery system for BNCT. **\$AU28,400** from Australian Nuclear Science and Technology Organisation (ANSTO).
2014 An active targeting delivery system for BNCT in the treatment of **brain glioblastoma** New Zealand Pharmacy Education and Research Foundation (NZPERF). **\$9,850**
2014 Industry collaboration: **\$68,000**. Transdermal Delivery III. Argenta NZ
2014 Industry collaboration: **\$6,000** (plus GST). Omeprazole oral paste. Labtec
2013 Reversal of drug resistance in cancer using novel liposomes. **\$11,034**. NZPERF
2012 Marsden Fund (Fast-Start): **\$345,000**. A novel strategy to guide drug to tumours. Royal Society of New Zealand. AI: Professor Bill Wilson, ACSRC
2012 Industry collaboration: **\$45,000**. Transdermal Delivery II. Argenta NZ
2011 Encapsulation of peptide **\$93,399**. NZ Ministry of Business Innovation & Employment
2011 NZ-China Research Alliance Grant: **\$344,939**. Improving efficacy and tissue tolerance of cancer chemotherapy. Ministry of Business Innovation & Employment. AI: Distinguished Professor Bruce Baguley, ACSRC
2011 Nanotechnology to improve drug absorption. **\$9,100**; NZPERF
2011 Industry collaboration: **\$45,000**. Transdermal Delivery I. Argenta NZ
2010 Novel injectable microemulsions for controlled drug release. **\$14,540**. NZPERF
2010 Improving venous tolerance of cancer chemotherapy using liposomes. **\$30,000**. Faculty Research Development Fund: FMHS, University of Auckland

RESEARCH GRANTS AS CO-INVESTIGATOR;

2017 (Joy Achum's PhD research) Faculty for the Future from Schlumberger Foundation
2016 Targeted drug delivery to white matter lesions in multiple sclerosis. **\$11,806**. Neurological Foundation of New Zealand (Dr Justin Dean, Dept of Physiology)
2013 Improved treatment of pancreatic cancer by a tumour-targeted combined delivery system. **\$158,387**. Auckland Medical Research Fund (A/P J Paxton)
2011 A bi-functional delivery strategy to overcome multidrug resistance in cancer: **\$150,000**. Cancer Society of NZ (A/P J Paxton, Dr Y Li, Pharmacology UoA).
2007 Technology for Business Growth: **\$2M**. NZFRST. New formulation technologies targeting bovine mastitis (jointly applied by Otago Uni, Massey Uni and Bomac Res Ltd).

INTERNATIONAL RESEARCH LINKAGE

China Pharmaceutical University, Yantai University (China), Utah University, USA

EDITORIAL BOARD MEMBER

- *Pharmaceutical Development and Technology* (Impact factor 1.8)
- *Journal of Liposome Research* (Impact factor 1.9)

REFEREE for 20 journals: *Nature Communications; Oncotarget; Int J Nanomedicine; Nanoscale Res Letters; Int J Pharm; Mol Pharmaceutics; Eur J Pharmaceutics etc*

GRANT REVIEWER for national grants of Hong Kong, UK, Aus, NZ.

POST/GRADUATE SUPERVISION

- Currently supervise 4 PhD and 1 Masters students, and co-supervise 3 PhD students.
- Have supervised to completion 9 PhD, 14 Masters and 9 summer students, and 14 BPharm honours projects (70 students). Also 3 Postdoctoral research fellows.

| 1g. Total number of peer reviewed publications and patents | Journal articles | Book chapters | books edited | Conference proceedings | Patents |
|---|------------------|---------------|--------------|------------------------|---------|
| | 85 | 4 | 1 | 90 | 14 |

PART 2

2a. Research publications and dissemination. H-index: Scopus 16; Google 18.

Selected peer-reviewed journal articles in the past 5 year(*corresponding author)

Yin X, Feng S, Chi Y, Liu J, Sun K, Guo C, **Wu Z***. Estrogen-functionalized Liposomes Grafted with Glutathione-responsive Sheddable Chotoooligosaccharides for the Therapy of Osteosarcoma. *Drug Delivery* (IF 6.4) 2018. *in press*.

Zhang W, Li C, Jin Y, Liu X, Wang Z, Shaw JP, Baguley BC, **Wu Z***, Liu J*. Multiseed liposomal drug delivery system using micelle gradient as driving force to improve amphiphilic drug retention and its anti-tumor efficacy. *Drug Delivery*. **2018**; 25(1):611-22.

Yin X, Chi Y, Guo C, Feng S, Liu J, Sun K, **Wu Z***. Chitoooligosaccharides modified reduction-sensitive liposomes: enhanced cytoplasmic drug delivery and osteosarcoma-tumor inhibition in animal models. *Pharmaceutical Research*. 34(10):2172-84. **2017**.

Chapman R, Harvey M, Davies P, **Wu Z**, Cave G. Liposome supported peritoneal dialysis in rat amitriptyline exposure with and without intravenous lipid emulsion. *J Liposome Research*. 2017:1-7

Chi Y, Yin, Sun K, Feng, Liu J, Chen D, C. Guo C, **Wu Z***. Redox-sensitive and hyaluronic acid functionalized liposomes for cytoplasmic drug delivery to osteosarcoma in animal models. *Journal of Controlled Release (IF 7.7)*, 261, 113-25, 2017

Kang E, Svirskis D, Sarojini V, Bevitt J, **Wu Z***. Cyclic-(RGDyC)-liposomes for dual-targeting tumour vasculature and cancer cells in glioblastoma. *Oncotarget*. 8(22):36614-27. **2017**

Yang M, Wilson RW, **Wu Z***. pH-Sensitive PEGylated liposomes for delivery of an acidic dinitrobenzamide mustard prodrug: Pathways of internalization, cellular trafficking and cytotoxicity to cancer cells. *Int J Pharmaceutics*. 516(1-2):323-33. **2017**

Badenhorst T, Darren Svirskis D, Merrilees D, Bolke L, **Wu Z***. Effects of GHK-Cu on MMP and TIMP expression, collagen and elastin production, and facial wrinkle parameters. *Journal of Aging Science*. 4: 166. **2016**

Zhang W, Li C, Baguley BC, Zhou F, Zhou W, Shaw JP, Wang Z, **Wu Z***, Liu J*. Optimization of the formation of embedded multicellular spheroids of MCF-7 cells: How to reliably produce a biomimetic 3D model. *Anal Biochem*. 515: 47-54. **2016**

Zhang W; Falconer JR, Baguley BC, Shaw JP, Liu J, **Wu Z.*** Improving drug retention in liposomes by aging with the aid of glucose. *Int J Pharmaceutics*. 505:194–203. **2016**

Xu H, Paxton JW, **Wu Z***. Development of long-circulating pH-sensitive liposomes for the reversal of gemcitabine resistance in pancreatic cancer cells. *Pharmaceutical Research*. 33(7):1628-37. **2016**.

Kanamala M, Wilson RW, Yang M, Palmer D, **Wu Z***. Mechanisms and biomaterials in pH-responsive tumour targeted drug delivery. *Biomaterials*. 85:152-67. **2016**

Cave G, **Wu Z**, Hunter N, Damitz R, Chauhan A, Harvey M. Reversal of lipophilic weak bases using pH gradient acidic centre liposomes; demonstration of effect in dabigatran induced anticoagulation. *Clinical Toxicology*. 54(5):428-33. **2016**

Badenhorst T; Svirskis D, **Wu Z***. Physicochemical characterization of native glycyl-L-histidyl-L-lysine tripeptide for wound healing and anti-aging. *Pharmaceutical Development and Technology*. 21(2):152-60. **2016**

Chen D, Sun J, Sun K, Liu W, **Wu Z***. *In vivo* evaluation of novel ketal-based oligosaccharides of hyaluronan micelles as multifunctional CD44 receptor-targeting and tumor pH-responsive carriers. *Artifi Cells Nanomed Biotechno*. 44:898-902. **2016**

Li J, Zhang X, Wang M, Li X, Mu H, Wang A, Li Y, **Wu Z**, Sun K. Synthesis of a bi-functional dendrimer-based nanovehicle co-modified with RGDyC and TAT peptides for

neovascular targeting and penetration. *Int J Pharmaceutics*. 50:112-23. **2016**

Zhang W; Wang G; See E; Shaw JP; Baguley BC; Liu J; Amirapu S; **Wu Z***. Post-insertion of poloxamer 188 strengthened liposomal membrane and reduced drug irritancy and in-vivo precipitation, superior to PEGylation. *Journal of Controlled Release*. 203:161-9. **2015**

Falconer JR, Svirskis D, Ali AA, **Wu Z***. Supercritical fluid technologies to fabricate proliposomes. *J Pharmacy & Pharmaceutical Sciences* 18(5):747-64. **2015**

Xu H, Paxton JW, **Wu Z***. Enhanced pH-responsiveness, cellular trafficking, cytotoxicity and long-circulation of PEGylated liposomes with post-insertion technique using gemcitabine as a model drug. *Pharmaceutical Research*. 32(7):2428-38. **2015**.

Abdelkader H; Pierscionek B; Carew M; **Wu Z**; Alany GR. Critical appraisal of alternative irritation models: three decades of testing ophthalmic pharmaceuticals. (Invited review) *British Medical Bulletin*. 113(1):59-71. **2015**

Zhang W; Wang G; Falconer JR; Baguley BC; Shaw JP; Liu J; Xu H; See E; **Wu Z***. Strategies to maximize liposomal drug loading for a poorly water-soluble anticancer drug. *Pharmaceutical Research*. 32(4):1451-61. **2015**.

See E; Zhang W; Liu J; Svirskis D, Baguley BC; Shaw JP; Wang G; **Wu Z***. Physicochemical characterization of asulacrine towards the development of an anticancer liposomal formulation. *International J Pharmaceutics*. 473: 528-35. **2014**

Xu H, Paxton JW, Li Y, Lim J, Zhang W, Duxfield L, **Wu Z***. Development of high-content gemcitabine PEGylated liposomes and their cytotoxicity on drug-resistant pancreatic tumour cells. *Pharmaceutical Research*. 31(10) 2583-92. **2014**.

Xu H, Paxton JW, Li Y, Lim J, **Wu Z***. Development of a gradient high performance liquid chromatography assay for hydrophilic gemcitabine and lipophilic curcumin using a central composite design and its application in liposome development. *J Pharmaceutical and Biomedical Analysis*. 98, 371-8. **2014**

Badenhorst T; Svirskis D, **Wu Z***. Pharmaceutical strategies to topical dermal delivery of peptide/proteins for cosmetic and clinical therapeutic applications. *Austin Journal of Pharmacology & Therapeutics*. Open access. 2(6):10. **2014**

Chen D, Sun J, Lian S, Liu Z, Sun K, Liu W, **Wu Z***, Zhang Q. Dual pH-responsive and CD44 receptor targeted multifunctional nanoparticles for anticancer intracellular delivery. *J Nanoparticle Research*. 16 (11): 2743. **2014**

Falconer R, **Wu Z**, Lau H, Suen J, Wang L, Pottinger S, Lee E, Alazawi N, Kallesen M, Derryn Da, Swift S, Svirskis D. An investigation into the stability and sterility of citric acid solutions used for cough reflex testing. *Dysphagia*. 29: 622-8. **2014**

Wu Z*, Alany GR, Tawfeet N, Falconer J, Zhang W, Hassan I, Ruthland M, Svirskis D; A study of microemulsions as prolonged-release injectables through *in-situ* phase transition. *Journal of Controlled Release (IF= 7.7)*. 174: 188-94. **2014**.

Wu Z*, Hassan D, Shaw JP. *In-vitro* Prediction of Bioavailability Following Extravascular Injection of Poorly Soluble Drugs: An insight into clinical failure and the role of delivery systems. *J Pharmacy and Pharmacology*. 65: 1429–39. **2013**.

Zhang W, He H, Liu J, Wang J, Zhang S, **Wu Z***. Pharmacokinetics and atherosclerotic lesions targeting effects of tanshinone IIA discoidal and spherical biomimetic high density lipoproteins. *Biomaterials*. 34:306-19. (**IP 8.31**). **2013**.

Ren X; Svirskis D; Alany RG; Zargar S, **Wu Z***. *In-Situ* phase transition from microemulsion to liquid crystal with the potential of prolonged parenteral drug delivery. *Int J Pharmaceutics*, 431(1-2): 130-7. **2012**

Abdelkader, H; **Wu Z**; Al-Kassas, R; Alany, RG. 'Niosomes and discomes for ocular

delivery of naltrexone hydrochloride: Morphological, rheological, spreading properties and photo-protective effects'. *Int J Pharmaceutics*, 433 (1-2): 142-8. **2012**

Jain R, **WU Z**, Bork O, Tucker IG. Pre-formulation and chemical stability studies of penethamate, a benzylpenicillin ester prodrug, in aqueous vehicles. *Drug Development and Industrial Pharmacy*. 38(1): 55-63. **2012**

Li D, Martini N, **WU Z**, Wen J. Development of an isocratic HPLC method for catechin quantification and its application to formulation studies. *Fitoterapia*. 83:1267-74. **2012**

Book / Chapters

1. FENG N and **WU Z** (ed) *Pharmaceutical Technologies for Chinese Materia Medica - A Laboratory Handbook*. A bilingual (English and Chinese) textbook in China "13th Five-Year Plan" for National Institutions of Higher Education. Science Publishing & Media, Beijing. 2018. ISBN: 978-7-03-057014-7

2. GRANT C, HARVEY M, **WU Z***. Drug scavenging lipid based nanoparticles as detoxifying agents. Vol. 2: Emerging applications of nanoparticles and architecture nanostructures: current prospects and future trends. In Barhoum A. (ed.) *Handbook of Nanoparticles*". Elsevier Publishing, Oxford, UK, 2018. ISBN: 978-7-03-057014-7

3. REGINALD-OPARA J, DEAN J, **WU Z***. Advancements in liposomes for targeted drug delivery against neurodegenerative diseases (Chapter 4). In Benjamin R. Pearson (ed.) *Liposomes: Historical, Clinical and Molecular Perspectives*. Nova Science Publishers. New York, 2017. ISBN1536121320

4. YANG M, KANAMALA M, TANG M, **WU Z***. Advances in pH-sensitive Liposomes for Cancer Therapy (Chapter 5). In Benjamin R. Pearson (ed.) *Liposomes: Historical, Clinical and Molecular Perspectives*, NY 11788 USA. Nova Science Publishers, Inc. New York, 2017. ISBN1536121320

5. KANG E, SVIRSKIS D, **WU Z***. Liposome based boron neutron capture therapy for brain glioma: Current and future perspectives (Chapter 11). In Benjamin R. Pearson (ed.) *Liposomes: Historical, Clinical and Molecular Perspectives*. Nova Science Publishers, Inc. New York, USA, 2017, ISBN1536121320

Keynote or Invited conference speech

(Fully EXPENSES-PAID)

2017 Taishan Academic Forum: Trends in DDS Evaluation: (Keynote Speaker) Topic: In vitro in vivo evaluation of parenteral delivery systems. Yantai, China. Dec 8-10.

The 2016 Chinese National Pharmaceutical Conference, Invited by China Pharmaceutical Association. Nanjing, Nov 18-20, 2016

2015 Taishan Academic Forum on Drug Targets and Evaluation, (invited Speaker by Yantai University). "Fit-for-destination" formulations: nanotechnology and targeted drug delivery. Yantai, China. 28-29 Nov 2015

2013 the 15th Formulation and Delivery of Bioactives Conference. Dunedin, New Zealand. Topic: Targeting the tumour microenvironments. 13/14 Feb 2013

The 5th Symposium from Experts on Contemporary Pharmaceutical Research. Nanjing. Funded via National Key Hi-Tech Innovation Project for the R&D of Novel Drugs administered by the China Ministry of Science and Technology. 16 - 20 Dec

The Australian & NZ Chapters of the Controlled Release Society (CRS), 3rd Workshop: 'In vitro Drug Release and Dissolution Testing': *Enhance drug dissolution by using Cyclodextrins*. 29 Nov-3 Dec 2010 at Monash University; University of Auckland.

The Australian & NZ CRS Workshop: Enhance Drug Solubility: Topic: *Enhance drug solubility using Cyclodextrins*. 30 Nov-4 Dec, 2009 University of Queensland and

University of Auckland

Non-or partially expense-paid

(Keynote Speaker) Advances in Functionalised Surface Modification of Liposomes for Cytoplasmic Drug Delivery. International Conference & Exhibition on Pharmaceuticals & Novel Drug Delivery Systems. London, UK, June 21-23/2018 (Conference committee)

2017 New Zealand-Australian Controlled Release Society 2017 Joint Workshop Topic: Predicting bioavailability and biocompatibility of injectables. The University of Auckland. 22-23 November 2017 (conference Chair)

New Zealand Breast Cancer Symposium. Topic: 'Getting drugs to their targets: the role of drug delivery in breast cancer treatment'. 12-14 Nov 2017, Auckland. (Session chair)

(Invited speaker for the Young Scientist Saturday Workshop). Fundamentals of Research: Parenteral Drug Delivery. The 40th Controlled Release Society Annual Meeting & Exposition. Hawaii. 19th -24 Jul, 2013

(Invited Speaker, Conference session co-chair). Towards Safe and Effective Delivery of Cytotoxic Agents to Cancer Cells. The 2nd Annual Symposium of Drug Delivery System. Nanjing. 8-11 Nov 2012.

(Invited Speaker, Conference session co-chair). Topic: Improving Biocompatibility in Parenteral Drug Delivery. 1st Annual Symposium of Drug Delivery Systems (SDDS). Shenzheng, China 3-6 Nov 2011.

Refereed conference proceedings (selected with students awards)

Kanamala M, Wilson W, Palmer B, **Wu Z**. Endosomal escape ability and anti-tumor efficiency of dual pH-sensitive liposomes. The 44th Controlled Release Society Annual Meeting. Boston, USA. 16-19 July 2017. (**Winner of the CRS Foundation Robert Langer Travel Grant Awards from the International CRS**).

Kang E, Svirskis D, Yang Yi, McGregor A, Sarojini V, **Wu Z**. Cyclic-RGDyC functionalized liposomes for dual-targeting of tumour vasculature and cancer cells in glioblastoma: A new strategy to improve BNCT efficacy. The 44th Controlled Release Society Annual Meeting. Boston. 16-19 July 2017. (**Winner of the CRS Local Chapter Young Scientist Travel Grant Awards from the International CRS**).

Yang M, Wilson W, Palmer B, **Wu Z**. Formulation and In-vitro Cytotoxicity of pH-sensitive Liposomes for a Novel Hypoxia-activated Prodrug. The 42nd Controlled Release Society Annual Meeting. (2-page abstract) Edinburgh, Scotland. 26-29 July 2015. (**International CRS Foundation Nicholas A. Peppas Student Travel Grant Awards**).

Tsang HT, et al, Svirskis D, Dean J, **Wu Z**. Hyaluronan-coated liposomes for targeting demyelinating diseases. "**Best Non-Doctoral Oral Presentation Award** at 2016 HealthX conference, The University of Auckland.

Patents (selected)

Tucker IG; **Wu Z**; Leech WF; Alawi F. Anti-infective formulation and methods of use. WIPO,WO/2010/044679, 2010. **Also:** AU2009304000 (A1); EP2344168 (A1); PCT/NZ2008/571347(A); BRPI0918662 (A2)

Wu Z, Medicott NJ, Tucker IG, Razzak M. Improved Chemical Delivery Formulations. Patent No. WO2006/022562. Published March 2006. Granted April 2007