

Zhijie Wang

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Education

State University of New York at Buffalo, Buffalo, NY
Ph.D. in Mechanical Engineering (Bioengineering) 2004-2008
M.S. in Mechanical Engineering (Bioengineering) 2001-2004
Zhejiang University, Hangzhou, China
B.S. in Biomedical Engineering (Minor: English) 1996-2001

Experience

Assistant Professor
Dept. of Mechanical Engineering, Colorado State University
2016– present

Research Assistant Scientist (Non-tenure track research faculty)
Dept. of Biomedical Engineering, University of Wisconsin – Madison
2013– 2016

Research Associate (Postdoc Mentor: Prof. Naomi C. Chesler)
Dept. of Biomedical Engineering, University of Wisconsin – Madison
2008– 2013

Research Assistant (PhD Mentor: Prof. Hui Meng)
Dept. of Mechanical Engineering, SUNY – buffalo
2002– 2008

Teaching Assistant, Dept. of Mechanical Engineering, SUNY – buffalo
2001– 2002

Award and Honors

- **2013 Council on AHA Basic Cardiovascular Science Abstract Travel Award**
- **2013 NextProf Future Faculty Workshop Selected Participants**
- **2012 NSF ADVANCE Postdoctoral Seminar Award**
- **2009 – 2011 AHA Midwest Affiliate Postdoctoral Fellowship**
- **2006 Journal Cover of Neurosurgery (November 2006)**
- **2007 Journal Cover of Stroke (June 2007)**
- **2003 Red ribbon award in the 53th Annual Meeting of Congress of Neurological Surgeons (CNS)**

Grant

- 2016 AHA Scientist Development Grant (**PI: Zhijie Wang**). “Cardiopulmonary biomechanical changes in pulmonary arterial hypertension (PAH): Role of VEGF signaling”, pending.
- NIH Exploratory/Developmental Bioengineering Research Grants (R21) (**Collaborator: Zhijie Wang**): 1 R21 HL121493-01A1, “Impact of the micromechanical environment on inflammation in AAA progression”, \$406K, 2014-2017.

- AHA Midwest Affiliate Postdoctoral Fellowship (**PI: Zhijie Wang**): 10POST2640148, “Role of collagen content and crosslinking in pulmonary artery stiffness and damping in hypoxic pulmonary hypertension”\$91K, 2009-2011.

Memberships

Biomedical Engineering Society (BMES), American Society of Mechanical Engineers (ASME), American Heart Association (AHA), American Physiological Society (APS), American Thoracic Society (ATS).

Professional activities

- **Moderating conference sessions for** AHA Scientific Sessions, BMES Annual Meeting, the Summer Biomechanics, Bioengineering & Biotransport (SB3C) Conference.
- **Reviewing journal manuscripts for** Stroke, Medical Physics, Journal of Applied Physiology, American Journal of Physiology, Cardiovascular Engineering and Technology, Biomechanics and Modeling in Mechanobiology, Biorheology, International Journal of Molecular Sciences, American Journal of Respiratory Cell and Molecular Biology, Journal of Biomechanical Engineering, and Annals of Biomedical Engineering, BioMed Research International.
- **Reviewing conference abstracts for** the Summer Biomechanics, Bioengineering & Biotransport (SB3C) Conferences, BMES annual meetings, the 2nd International Conference on Biomedical Engineering and Biotechnology, the 7th World Congress of Biomechanics, AHA Scientific Sessions.

Skills

- Animal disease models and experiences with mouse, rat, dog and rabbit.
- Ex vivo arterial mechanical measurements
- Ex vivo pulmonary vascular impedance measurements
- In vivo pulmonary vascular impedance and ventricular function measurements
- In vitro second harmonic generation (SHG) microscopy imaging on fresh tissues
- Histology and immunohistochemistry; RT-qPCR, western blot and ELISA
- Collagen-PEG and collagen-PAG hydrogel fabrication and mechanical tests
- In vivo rotational (3D) angiogram acquisition and phantom tests using the Toshiba Infinix vs-i system
- In vitro flow measurements using angiograms or particle imaging velocimetry (PIV)
- Programming: Matlab, Pascal, C/C++, Fortran, Maple, ImageTool, and R (statistical analysis software)

Student Mentored

John Krutty, David Schreier, Isaiah Mwangi and Eric Nguyen (all BME graduates), Mark Golob (Material Science graduate), Jayden Cline (Biochemistry undergraduate), and Bilin Loi, Hinnah Abid, Michael Quirk, Kevin McConnell, Jacob Stangl, Clayton Lepak, Molly Krohn, Rebecca Clayman and Nick Balge (all BME undergraduates).

Journal Publication

1. **Wang ZJ**, Hoffmann KR, Wang Z, Rudin S, Guterman LR, Meng H. Contrast settling in cerebral aneurysm angiography. *Phys Med Biol.* 2005;50:3171-3181
2. Meng H, Swartz DD, **Wang Z**, Hoi Y, Kolega J, Metaxa EM, et al. A model system for mapping vascular responses to complex hemodynamics at arterial bifurcations in vivo. *Neurosurgery.* 2006;59:1094-1100; discussion 1100-1091
3. Meng H, Swartz DD, **Wang ZJ**, Hoi Y, Kolega J, Metaxa E, et al. In vivo model to correlate complex geometries with hemodynamics associated with cerebral aneurysm development. *J Biomech.* 2006;39:S327
4. Meng H, **Wang Z**, Kim M, Ecker RD, Hopkins LN. Saccular aneurysms on straight and curved vessels are subject to different hemodynamics: Implications of intravascular stenting. *AJNR Am J Neuroradiol.* 2006;27:1861-1865
5. Metaxa E, Kolega J, Szymanski MP, **Wang ZJ**, Swartz DD, Meng H. Distinguishing endothelial responses to impingement force, wall shear stress, and wall shear stress gradient. *J Biomech.* 2006;39:S312

6. Meng H, **Wang Z**, Hoi Y, Gao L, Metaxa E, Swartz DD, et al. Complex hemodynamics at the apex of an arterial bifurcation induces vascular remodeling resembling cerebral aneurysm initiation. *Stroke*. 2007;38:1924-1931
7. **Wang Z**, Kolega J, Hoi Y, Gao L, Swartz DD, Levy EI, et al. Molecular alterations associated with aneurysmal remodeling are localized in the high hemodynamic stress region of a created carotid bifurcation. *Neurosurgery*. 2009;65:169-177; discussion 177-168
8. **Ooi CY**, **Wang Z**, Tabima DM, Eickhoff JC, Chesler NC. The role of collagen in extralobar pulmonary artery stiffening in response to hypoxia-induced pulmonary hypertension. *American journal of physiology. Heart and circulatory physiology*. 2010;299:H1823-1831
9. **Wang Z**, Chesler NC. Pulmonary vascular wall stiffness: An important contributor to the increased right ventricular afterload with pulmonary hypertension. *Pulmonary circulation*. 2011;1:212-223
10. Tabima DM, Roldan-Alzate A, **Wang Z**, Hacker TA, Molthen RC, Chesler NC. Persistent vascular collagen accumulation alters hemodynamic recovery from chronic hypoxia. *J Biomech*. 2012;45:799-804
11. **Wang Z**, Chesler NC. Role of collagen content and cross-linking in large pulmonary arterial stiffening after chronic hypoxia. *Biomech Model Mechanobiol*. 2012;11:279-289
12. **Wang Z**, Lakes RS, Eickhoff JC, Chesler NC. Effects of collagen deposition on passive and active mechanical properties of large pulmonary arteries in hypoxic pulmonary hypertension. *Biomech Model Mechanobiol*. 2013;12:1115-1125
13. Tewari SG, Bugenhagen SM, **Wang Z**, Schreier DA, Carlson BE, Chesler NC, et al. Analysis of cardiovascular dynamics in pulmonary hypertensive c57bl6/j mice. *Frontiers in physiology*. 2013;4:355
14. Tian L, **Wang Z**, Lakes RS, Chesler NC. Comparison of approaches to quantify arterial damping capacity from pressurization tests on mouse conduit arteries. *J Biomech Eng*. 2013;135:54504
15. **Wang Z**, Chesler NC. Pulmonary vascular mechanics: Important contributors to the increased right ventricular afterload of pulmonary hypertension. *Exp Physiol*. 2013;98:1267-1273
16. **Wang Z**, Kristianto J, Yen Ooi C, Johnson MG, Litscher SJ, Pugh TD, et al. Blood pressure, artery size, and artery compliance parallel bone size and strength in mice with differing ece1 expression. *J Biomech Eng*. 2013;135:61003-61009
17. **Wang Z**, Lakes RS, Golob M, Eickhoff JC, Chesler NC. Changes in large pulmonary arterial viscoelasticity in chronic pulmonary hypertension. *PLoS One*. 2013;8:e78569
18. **Wang Z**, Schreier DA, Hacker TA, Chesler NC. Progressive right ventricular functional and structural changes in a mouse model of pulmonary arterial hypertension. *Physiol Rep*. 2013;1:e00184
19. Liu A, Schreier D, Tian L, Eickhoff JC, **Wang Z**, Hacker TA, et al. Direct and indirect protection of right ventricular function by estrogen in an experimental model of pulmonary arterial hypertension. *American journal of physiology. Heart and circulatory physiology*. 2014;307:H273-283
20. *Bellofiore A, ***Wang Z**, Chesler NC. What does the time constant tell us about progressive right ventricular dysfunction in pulmonary arterial hypertension? *Pulmonary circulation*. 2015;5(2):291-295
21. Golob MJ, Tian L, **Wang Z**, Zimmerman TA, Caneba CA, Hacker TA, et al. Mitochondria DNA mutations cause sex-dependent development of hypertension and alterations in cardiovascular function. *J Biomech*. 2015;48:405-412
22. Tian L, **Wang Z**, Liu Y, Eickhoff JC, Eliceiri KW, Chesler NC. Validation of an arterial constitutive model accounting for collagen content and crosslinking. *Acta Biomater*. 2016;31:276-287
23. **Wang Z**, Patel JR, Schreier DA, Hacker TA, Moss RL, Chesler NC. Right ventricular dysfunction in a mouse model of pulmonary arterial hypertension occurs in the absence of myocyte mechanical impairment. (In Preparation, 2016)
24. Golob M, **Wang Z**, Prostrollo A, Hacker T, Chesler NC. Limiting collagen turnover via collagenase-resistance attenuates right ventricular dysfunction and fibrosis in pulmonary arterial hypertension. (In Press, 2016)
25. **Wang Z**, Schreier DA, Abid H, Song G, Hacker TA, Chesler NC. Pulmonary vascular collagen content, not cross-linking, contributes to right ventricular pulsatile afterload and overload in hypoxic pulmonary hypertension. (In Revision, 2016)

Invited Book Chapter

1. **Wang Z**, Tian L, Chesler NC. "Pulmonary Vascular Mechanics in Pulmonary Hypertension." *Mechanobiology: Exploitation for Medical Benefit*. Wiley Press, ISBN: 978-1-118-96614-3, 2016
2. **Wang Z**, Golob M, Chesler NC "Viscoelastic properties of cardiovascular tissues." *Viscoelastic and Viscoplastic Materials*. InTech, ISBN 978-953-51-2603-4, Print ISBN 978-953-51-2602-7, 2016

Conference Presentations and Invited Talks

1. **Wang Z**, Hacker TA, Chesler NC. Time-dependent effect of VEGF blockade on PAH progression. ATS 2016 International Conference, 2016, San Francisco, CA.
2. **Wang Z**, Morgan S, Golob M, Liu Z, Liu B, Chesler NC. Stiffer Arterial Wall Enhances Aortic Aneurysm Formation in a Mouse Model via Elastase Infusion. Summer Biomechanics, Bioengineering and Biotransport Conference, (Oral Presentation) 2015, Snowbird, UT.
3. Golob MJ, **Wang Z**, Prostrollo AJ, Hacker TA, Diarra G, Chesler NC. Impaired Collagen Degradation Prevents Right Ventricular Hypertrophy And Dysfunction With Development Of Pulmonary Arterial Hypertension, Summer Biomechanics, Bioengineering and Biotransport Conference, (Oral Presentation) 2015, Snowbird, UT.
4. **Wang Z**, Liu Z, Golob M, Liu B, Chesler NC. Stiffer arterial wall enhanced aortic aneurysm formation in an elastase aneurysm mouse model. 2014 Aortic Symposium, (Oral Presentation) 2014, Lexington, KY.
5. **Wang Z**, Schreier DA, Song G, Hacker TA, Chesler NC. Differential effects of proximal and distal pulmonary artery remodeling on right ventricular function during pulmonary arterial hypertension development. 7th World Congress of Biomechanics, 2014, Boston, MA.
6. **Wang Z**, Patel JR, Schreier DA, Hacker TA, Moss RL, Chesler NC. Right Ventricular Hemodynamic And Cellular Changes In A Mouse Model Of Severe Pulmonary Arterial Hypertension. AHA Scientific Sessions. 2013, Dallas, TX.
7. **Wang Z**, Patel JR, Schreier DA, Hacker TA, Moss RL, Chesler NC. Progression of Right Ventricular Cellular and Whole Organ Dysfunction in Pulmonary Arterial Hypertension. Cardiac Physiome Workshop, (Invited Talk) 2013, Bar Harbor, ME.
8. Tewari SG, Bugenhagen SM, **Wang Z**, Schreier DA, Carlson BE, Chesler NC, Beard DA. Analysis of cardiovascular dynamics in pulmonary hypertensive C57BL6/J mice. Cardiac Physiome Workshop, 2013, Bar Harbor, ME.
9. **Wang Z**, Schreier DA, Song G, Liu A, Hacker TA, Chesler NC. The effect of an anti-fibrotic agent on pulmonary arterial hypertension progression in rats. The 1st Annual Metro Chicago Resesarch Network Symposium, Transgenic Approaches to Cardiovascular Disease: Past, Present and Future. 2013, Chicago, IL.
10. **Wang Z**, Patel JR, Schreier DA, Hacker TA, Chesler NC. Right ventricular dysfunction in pulmoanry arterial hypertension: cellular and hemodynamic changes in a mouse model. Summer Bioengineering Conference, (Oral Presentation) 2013, Sunriver, OR.
11. **Wang Z**. Changes in right ventricular function and trabeculae biomechanics in a mouse model of severe pulmonary hypertension. Penn Pulmonary Vascular Disease Symposium (Invited Talk) 2013, Philadelphia, PA
12. **Wang Z**, Hacker TA, Chesler NC. Effects of collagen accumulation on proximal arterial stiffening and distal arterial narrowing during hypoxic pulmonary hypertension. ATS 2013 International Conference, 2013, Philadelphia, PA.
13. **Wang Z**, Lakes RS, Chesler NC. Changes in conduit pulmonary arterial static and dynamic mechanical properties during severe hypoxic pulmonary hypertension. Summer Bioengineering Conference, (Oral Presentation) 2012, Fajardo, Puerto Rico.
14. **Wang Z**, Schreier D, Hacker A, Chesler NC. Changes in right ventricular function in a severe pulmonary hypertension mouse model. Thomas L. Petty Aspen Lung Conference, 55th Annual Meeting, "Mechanics and Mechanisms of Pulmonary Hypertension", (Oral Presentation) 2012, Aspen, CO.
15. **Wang Z**, Lakes RS, Chesler NC. Hypertension alters viscoelasticity in mouse conduit pulmonary artery. The 7th International Symposium on Biomechanics in Vascular Biology & Cardiovascular Disease, 2012, Atlanta, GA
16. **Wang Z**, Chesler NC. effects of collagen content & cross-linking on large pulmonary artery stiffening in chronic hypoxia. (Oral Presentation) BMES Annual Meeting, Hartford, CT.
17. Kristianto J, Fisher JS, Johnson MG, **Wang Z**, Ooi CY, Litscher SJ, Chesler NC, Blank RD. Pleiotropy Involving Skeletal, Vascular, and Reproductive Phenotypes in Recombinant Congenic Mice. The Endocrine Society's 93rd Annual Meeting & Expo, 2011, Boston, MA.
18. Kristianto J, Fisher JS, Johnson MG, **Wang Z**, Ooi CY, Litscher SJ, Chesler NC, Blank RD. Pleiotropy Involving Skeletal, Vascular, and Reproductive Phenotypes: Convergence via Endothelin Signaling and Nos3 Activity. (Oral Presentation) Mouse genetics, 2011, Washington DC.
19. **Wang Z**, Chesler NC. Role of Collagen Content and Cross-linking in Large Pulmonary Arterial Stiffening During Hypoxic Pulmonary Hypertension. (Oral Presentation) Summer Bioengineering Conference, 2010, Naples, FL.

20. **Wang Z**, Chesler NC. Role of collagen in large pulmonary artery viscoelasticity changes in hypoxic pulmonary hypertension. Pittsburgh International Lung Conference. 2009, Pittsburgh, PA.
21. **Wang Z**, Chesler NC. Role of collagen in large pulmonary artery viscoelasticity changes in hypoxic pulmonary hypertension. BMES Annual Meeting, 2009, Pittsburg, PA.
22. Ooi CY, Sandhu G, **Wang Z**, Hacker TA, Saless N, Litscher SJ, Whitesell LF, Chesler NC, Blank RD. Potential Shared Remodeling Mechanisms between Vascular and Skeletal Systems. (Oral Presentation) BMES Annual Meeting, 2009, Pittsburg, PA.
23. Meng H, Dhar S, Gao L, Hoi Y, Kolega J, Levy E, Mandelbaum M, Metaxa E, Mocco J, Natarajan SK, Siddiqui A, Tremmel M, **Wang Z**, Xiang J, Hopkins LN. "Hemodynamic Factors Contributing to Aneurysm Formation and Rupture." (Oral Presentation) The 6th International Intracranial Stent Meeting 2009: Tidal Wave from Coil to Prosthesis, from Embolization to Reconstruction (in conjunction with The 17th Meeting of Neuroendovascular Therapy Sendai Seminar 2009), 2009, Sendai, Japan.
24. Ooi CY, Sandhu G, **Wang Z**, Hacker TA, Saless N, Litscher SJ, Whitesell LF, Chesler NC, Blank RD. Do Skeletal and Vascular Modeling Utilize Shared Mechanisms? American Society for Bone and Mineral Research 31st Annual Meeting, 2009, Denver, CO.
25. Ooi CY, **Wang Z**, Chesler NC. Collagen accumulation is a significant contributor to pulmonary hypertension-induced large artery stiffening. *Artery* 8, 2008, Gent, Belgium.
26. **Wang Z**, Hoi Y, Gao L, Metaxa E, Swartz DD, Kolega J, Meng H. Impinging flow induces aneurysmal remodeling. (Oral Presentation) BMES Annual Meeting, 2007, Los Angeles, CA.
27. **Wang Z**, Hoi Y, Gao L, Metaxa E, Swartz DD, Kolega J, Meng H. Impinging flow induces aneurysmal remodeling. (Oral Presentation) The First Annual Neuroscience Research Day, 2007, Buffalo, NY.
28. Hoi Y, **Wang Z**, Gao L, Swartz D, Kolega JP and Meng H. 'Vascular remodeling at the apices of arterial bifurcations and implications in aneurysm development.' BMES Annual Meeting, 2006, Chicago, IL.
29. Yamamoto J; Meng H; Swartz DD; **Wang Z**; Hoi Y; Kolega J; Metaxa EM; Szymanski MP; Gao L; Paciorek AM; Sauvageau E; Levy EI; Hopkins LN. 'A Model System for Mapping Vascular Responses to Complex Hemodynamics at Arterial Bifurcations In Vivo.' Congress of Neurological Surgeons, 56th Annual Meeting, 2006, Chicago, IL.
30. Meng H, Swartz DD, **Wang Z**, Hoi Y, Kolega J, Metaxa E, Szymanski MP, Gao L, Paciorek AM, Yamamoto J, Sauvageau E, Levy EI, Hopkins LN. In vivo model to correlate complex geometries with hemodynamics associated with cerebral aneurysm development. 5th World Congress of Biomechanics, 2006, Munich, Germany.
31. Metaxa E, Kolega J, Szymanski MP, **Wang Z**, Swartz DD, Meng H. Distinguishing endothelial responses to impingement force, wall shear stress, and wall shear stress gradient. 5th World Congress of Biomechanics, 2006, Munich, Germany.
32. Meng H, Swartz DD, **Wang Z**, Hoi Y, Kolega J, Metaxa EM, Szymanski MP, Gao L, Paciorek AM, Yamamoto J, Sauvageau E, Levy EI, Hopkins LN. Vascular response to complex hemodynamics in the apex of a created arterial bifurcation indicating aneurysm development. Summer Bioengineering Conference, 2006, Amelia Island, FL.
33. Metaxa E, Kolega J, Szymanski MP, **Wang Z**, Gao L, Hoi Y, Woodward SH, Swartz DD, Meng H. Endothelial cell proliferation under high wall shear stress. Summer Bioengineering Conference, 2006, Amelia Island, FL.
34. Meng H, Swartz DD, **Wang Z**, Gao L, Hoi Y, Kolega J, Metaxa E, Szymanski MP, Paciorek AM, Yamamoto J, Sauvageau E, Levy EI, Hopkins LN. Development of Aneurysm-like Remodeling on Vessels Subjected to Impinging Flow. *Experimental Biology*, 2006, San Francisco, CA.
35. H Meng, **ZJ Wang**, Y Hoi, L Gao, E Metaxa, DD Swartz, J Kolega, MP Szymanski, AM Pacieorek, E Sauvageau, J Yamamoto, LN Hopkins. Vascular Response to Impinging Flow in a Created Bifurcation Indicates Early Aneurysm Development., BMES Annual Meeting, 2005, Baltimore, MA.
36. **Z Wang**, H Meng, S Woodward, Y Hoi, S Rudin, LR Guterman, LN Hopkins. Importance of Parent Vessel Geometry for Aneurysm Stenting. Congress of Neurological Surgeons, 53th Annual Meeting, 2003, Denver, CO. (Red ribbon for outstanding papers)
37. S Woodward, **Z Wang**, B Bendok, H Meng, Modeling of DSA Images for Quantitative Comparison of Aneurysm Treatment Effectiveness. 2nd EMBS/BMES conference, 2002, Huston, TX.