
CURRICULUM VITAE

ZHIYING SHAN, PhD

CURRENT POSITION

Professor Department of Kinesiology and Integrative Physiology
Michigan Technological University (MTU)

Adjunct Professor Department of Biological Sciences, MTU

Adjunct Professor Department of Biomedical Engineering, MTU

CONTACT INFORMATION

Address: Michigan Technological University
Department of Kinesiology and Integrative Physiology (KIP)
1400 Townsend Dr.
Houghton, MI 49931
Phone: 906)-487-1757 Email: zhiyings@mtu.edu

EDUCATION

2001-2004: **PhD**
Nankai University, China.
Major: Molecular Genetics

1986-1989: **Master of Science**
Shandong University, China
Major: Zoology

1982-1986: **Bachelor of Science**
Liaoning Normal University, China,
Major: Biology.

EMPLOYMENT

2023,08 – Present: Michigan Technological University, Department of Kinesiology and Integrative Physiology, Professor

2019,09 – 2023,07: Michigan Technological University, Department of Kinesiology and Integrative Physiology, Associate Professor

2013,08 - 2019,08: Michigan Technological University, Department of Kinesiology and Integrative Physiology, Assistant Professor

2010,11 - 2013,07: University of Florida, Department of Physiology and Functional Genomics, Research Assistant Professor

2004,11 - 2010,10: University of Florida, Department of Physiology and Functional Genomics, Postdoctoral Associate

1997,08 - 2001,10: Tianjin Medical University Teaching Hospital, China, Research Associate Professor

1993,01-1997,07: Tianjin Medical University Teaching Hospital, China, Research Assistant Professor

1989,08 -1992,12: Institute of Traditional Chinese Medicine of Liaoning Province, China, Research Assistant Fellow

PROFESSIONAL MEMBERSHIPS

- 2005 - Present: Member of American Heart Association
- 2005 - Present: Member of the American Physiology Society
- 2014 - Present: Member of Michigan Physiology Society

TEACHING ACTIVITY

Courses Taught at Michigan Tech

- 2021-Present: KIP 2700, Essential Biochemistry (3 credit).
- 2020-Present: BMB6030, Modern BMB Laboratory (Co-instructor, 3 credit).
- 2018-Present: KIP4120, Molecular Exercise Physiology 3 credit)
- 2018: BMB6020, Advanced Molecular Biology (3 credit).
- 2016-2017: EH4750, Molecular Exercise Physiology (2 credit)
- 2015-Present: BL4370/BL5371, Advanced Cell Biology (3 credit).
- 2014, 2019, 2021: EH5350/KIP5510, Molecular Physiology (3 credit).
- 2014-2015: EH 5920, Graduate Seminar (1-credit).

RESEARCH ACTIVITY

Michigan Technological University is an Undergraduate-Focused Institution, which has not been a major recipient of NIH support (i.e. not totaling more than \$6 Million /year in 4 of the last 7 fiscal years) and is eligible for the Academic Research Enhancement Award (NIH R15) application.

A. Active Research Funding

1. NIHR01HL163159 04//15/2022-03/31/2026
Contribution of Orexin System to Hypertension
Role: **PI**
2. NIHR15HL150703: 08/11/2020-06/30/2023
Involvement of the Brain Orexin System in Hypertension
Role: **PI**
3. NIHR15HL145655: 09/01/2019-08/31/2023
Neural Mechanism of Sympathetic Activation in Heart Failure”
PI: Qinghui Chen (MTU)
Role: **Co-Investigator**.
4. Internal Pandemic Impact Grant 12/01/2021-11/30/2022
Role: **PI**

B. Completed Research Project

1. Portage Health Middle Career Fund 07/01/2020-08/31/2022
Brain Orexin System and Salt Sensitive Hypertension
Role: **PI**

2. NIH 1R15HL129213: 08/01/2016 - 06/30/2020
Brain (Pro)renin Receptor and Sympathetic Activation in Salt Sensitive Hypertension
Role: **PI**
3. AHA11SDG7420029: 07/01/2011 -06/30/2016
Role of Brain (Pro)renin Receptor in Hypertension
Role: **PI**
4. MTU Research Excellence Fund 07/01/2016-08/31/2017
Proinflammatory Cytokines and Sympathetic Activation in Salt Sensitive Hypertension
Role: **PI**
5. MTU Research Excellence Fund 07/1/2018-08/31/2019
Vasopressin Regulation in Salt Sensitive Hypertension.
Role: **PI**
6. NIHR15HL122952 11/01/2014-10/31/2018
ER Stress and Reduced SK Channel Function in PVN of Rats with High Salt Intake
PI: Qinghui Chen (MTU)
Role: **Consultant**
7. NIDAR01DA021274 05/01/2014-04/30/2019
Sex Differences in the Mechanisms that Promote Nicotine Reward and Withdrawal".
PI: Laura E. O'Dell (University of Texas at El Paso)
Role: **Consultant**

PROFESSIONAL SERVICES

A. Served as A Reviewer for National and International Funding Agencies and Others

2023; External reviewer for faculty promotion of Louisiana State University
 2022: Ad Hoc grant Reviewer for NIH Integrative Physiology & Pathology Study Section.
 2022: Ad-hoc grant Reviewer for Israel Science Foundation.
 2022: External reviewer for faculty promotion of California Health Science University
 2015-2018: Michigan Physiology Society meeting poster and oral presentation judge.

B. Served on Editorial Review Boards of Three Scientific Journals:

1. 2022- Present: Frontiers in Cellular Neurophysiology
2. 2018-2022: Present International Journal of Biochemistry and Physiology
3. 2014- Present Cellular and Molecular Neurobiology

C. Served as an Ad Hoc Reviewer for 20 Scientific Journals:

1. Acta Physiologica (IF:5.97)
2. American Journal of Physiology (AJP)- Heart Circulation Physiology (IF: 4.73)
3. AJP- Regulatory-Integrative and Comparative Physiology (IF: 3.62)
4. Brain Research (IF:3.25)
5. Cells | An Open Access Journal from MDPI (5.98)
6. Cellular and Molecular Neurobiology (IF:5.05)
7. Circulation Research (IF:17.37)
8. Experimental Physiology (IF:2.96)
9. Frontiers in Neuroscience (IF:4.87)

10. Frontiers in Physiology (IF:4.56)
11. Frontiers in Cellular Neurophysiology (IF:5.78)
12. Hypertension (IF:10.19)
13. Journal of the American Heart Association (IF:5.02)
14. International Journal of Biological Sciences (IF:6.58)
15. Molecular Medical Research (IF: 6.35)
16. Medical Science Monitor (IF:3.38)
17. Neuroscience Bulletin (IF:5.20)
18. Plos One (IF:3.75)
19. Pediatric Research (IF:3.75)
20. Scientific Reports (IF:4.54)

D. Served on Multiple Committees in the KIP Department and MTU

- 2013-Present: KIP Department Council Committee
- 2013-Present: KIP Department Graduate Candidate Reviewer
- 2013: KIP Department New Faculty Search Committee member
- 2013: KIP Department Graduate Proposal Committee member
- 2013: Member of Biotechnology Research Center (BRC) in MTU
- 2013-2016: Biological Science Dept. Graduate Candidate Review member
- 2015: KIP Department Program Assessment Committee member
- 2016: PHF (Portage Health Foundation) endowed professorships search committee
- 2016: MTU Life Science & Technology Institute Research Forum Judge
- 2016: KIP Department PhD program Proposal Committee member
- 2016-2017: Michigan Tech Summer Undergraduate Research Fellowship (SURF) reviewer
- 2016: Michigan Tech Research Excellence Fund (REF) reviewer
- 2018-Present: BMB program qualifying Committee
- 2019-2020: ECM committee for Kelly Kamm, an Assistant Professor in KIP Department
- 2019-2021: MTU Senate Administrative Policy Committee member
- 2021-Present: MTU Senate Research Policy Committee member
- 2018-2019: MTU Academic and Instructional Policy Committee
- 2018-Present: Michigan Tech Senate Alternate
- 2019-2022: KIP Department Curriculum Committee Chair
- 2019-2022: KIP Department Curriculum Coordinator
- 2019-2021: KIP Tenure and Promotion Committee Member
- 2021-2022: KIP Department Tenure and Promotion Committee Chair
- 2020-2021: ECM Advisor for Hoda Hatoum, Assistant Professor in BME Department
- 2021-2022: Early Career Management (ECM) advisor for Robert Larson, Assistant Professor in Biological Sciences Department
- 2021-2022: MTU Research Excellence Fund Proposal Review Panel.
- 2022: MTU Century II Campaign Endowed Equipment Fund Committee Member.
- 2022: MTU Undergraduate Student Research Forum Judge.

HONORS & AWARDS

(Including Awards of Students Under my Mentorship)

- 2022: Xinqian Chen (PhD student), received 2nd place in the MPS poster presentation.
- 2022: Sophia Bancker (undergraduate student), received the first place in Michigan Tech Research Forum poster presentation.
- 2021: Sophia Bancker (undergraduate student), received Pavlis Honors College Undergraduate Research Internship Program (URIP).
- 2021: Lilly Vanloon (undergraduate student), received Pavlis Honors College URIP
- 2019: Jeremy Bigalke (master student), Outstanding Presentation Award in Michigan Physiological Society meeting.
- 2019: Jeremy Bigalke (master student), 2nd place in MTU Life Science and Technology Institute Research Forum oral presentation.
- 2019: Jeremy Bigalke (master student), Best KIP Department Scholar Award.
- 2018: Jeremy Bigalke (master student), received MTU Songer Research Award.
- 2016: Michael Huber (master student), received American Physiological Society Caroline tum Student Award at Experimental Biology Conference 2016.
- 2016: Michael Huber (master student), received best poster presentation award in MTU Life Science and Technology Institute Research Form.
- 2010: New Investigator Award: American Heart Association Annual High Blood Pressure Research Conference.
- 2007: Science & Technology Achievement of Tianjin City, China.
- 2006: Science & Technology Achievement of Tianjin City, China.
- 2004: Major Award for Outstanding Graduates, Hong Kong Qiushi Foundation.
- 2004: Science & Technology Achievement of Tianjin City, China
- 1997: Science & Technology Achievement of Tianjin City, China
- 1993: Science & Technology Achievement of Liaoning Province, China

ORAL PRESENTATIONS AND INVITED TALKS

1. 2022: Oral Presentation: "Brain Orexin System and Salt Sensitive Hypertension". KIP department, Michigan Tech.
2. 2018: Jeremy Bigalke (a master student under my mentorship) Gull Lake Hypertension meeting, "Increased PVN Orexin Signaling Contributes to Sympathoexcitation in Salt Sensitive Hypertension, oral presentation.
3. 2013: Invited Talk: The role of brain prorenin receptor in neurogenic hypertension. Louisiana State University Health Sciences Center, College of Medicine, New Orleans,
4. 2013: Invited Talk: Brain prorenin receptor and hypertension. Michigan technological University, Houghton, Michigan.
5. 2012: Oral presentation: "Chronic blockade of the NTS AT1 receptor decreases circulating endothelial progenitor- inflammatory cells ratio and exacerbates hypertension in the SHR. Gordon Research Seminar: Angiotensin, Ventura, CA

6. 2012: Oral presentation: Paradoxical action of the NTS AT1 receptors on inflammation and hypertension. Gordon Research Conference: Angiotensin, Ventura, CA.
7. 2011: Oral presentation: "(pro)renin receptor (PRR) mediates antihypertensive effects in the nucleus of solitary tract of Spontaneously Hypertensive Rats (SHR)". 65th High Blood Pressure Research Conference, Orlando, FL.
8. 2010: Oral presentation: "Involvement of the brain (pro)renin receptor in cardiovascular homeostasis". 64th High Blood Pressure Research Conference, Washington, DC.

PEER REVIEWED PUBLICATIONS(53)

1. Bigalke J, Shan Z, Carter J. Orexin, sleep, sympathetic neural activity and cardiovascular function. *Hypertension*, 2022 (PMID: 36148653).
2. Fan Y, Jiang E, Gao H, Bigalke J, Chen B, Yu C, Chen Q, Shan Z. Activation of Orexin System Stimulates CaMKII Expression. *Front Physiol*. doi: 10.3389/fphys.2021.698185. 2021.
3. Gao H, Bigalke J, Jiang E, Fan Y, Chen B, Chen QH, Shan Z. TNF α Triggers an Augmented Inflammatory Response in Brain Neurons from Dahl Salt-Sensitive Rats Compared with Normal Sprague Dawley Rats. *Cell Mol Neurobiol*. doi: 10.1007/s10571-021-01056-9, 2021
4. Bigalke JA, Gao H, Chen Q, **Shan Z**. Activation of Orexin 1 receptors in the paraventricular nucleus contributes to the development of DOCA-salt hypertension through regulation of vasopressin (*Front. Physiol*: doi: 10.3389/fphys.2021.641331), 2021.
5. Uribe KP, Correa VL, Pinales BE, Flores RJ, Cruz B, **Shan Z**, Bruijnzeel AW, Khan AM, O'Dell LE. Overexpression of corticotropin-releasing factor in the nucleus accumbens enhances the reinforcing effects of nicotine in intact female versus male and ovariectomized female rats. *Neuropsychopharmacology* 2020, 45, 394-403.
6. Chapp AD, Behnke JE, Driscoll KM, Hahka T, LaLonde Z, **Shan Z**, Chen QH. Elevated L-lactate Promotes Major Cellular Pathologies Associated with Neurodegenerative Diseases. *Neurosci Bull* 2020.
7. Chapp AD, Behnke JE, Driscoll KM, Fan Y, Hoban E, **Shan Z**, Zhang L, Chen QH. Acetate Mediates Alcohol Excitotoxicity in Dopaminergic-like PC12 Cells. *ACS Chem Neurosci* 2019, 10, 235-245.
8. Jiang E, Chapp AD, Fan Y, Larson RA, Hahka T, Huber MJ, Yan J, Chen QH, **Shan Z**. Expression of proinflammatory cytokines is upregulated in the hypothalamic paraventricular nucleus of Dahl salt-sensitive hypertensive rats. *Front Physiol* 9, 104. 2018
9. Chapp AD, Schum S, Behnke JE, Hahka T, Huber MJ, Jiang E, Larson RA, **Shan Z**, Chen QH. Measurement of cations, anions, and acetate in serum, urine, cerebrospinal fluid, and tissue by ion chromatography. *Physiol Rep* 6, e13666. 2018
10. Fan Y, Jiang E, Hahka T, Chen Q, Yan J, **Shan Z**. Orexin A increases sympathetic nerve activity through promoting expression of proinflammatory cytokines in Sprague-Dawley rats. *Acta physiologica*, 222, 2018
11. Chapp AD, Cheng Z, **Shan Z**, Chen QH. Long-term high salt intake involves reduced SK currents and increased excitability of PVN neurons with projections to the rostral ventrolateral medulla in rats. *Neural Plasticity*, 7282834, 2017
12. Huber MJ, Chen QH, **Shan Z**. The Orexin System and Hypertension. *Cell Mol Neurobiol*. 2018 Mar;38(2):385-391.
13. Huber MJ, Fan Y, Jiang E, Zhu F, Larson RA, Yan J, Li N, Chen QH, **Shan Z**: Increased Activity of the Orexin System in the Paraventricular Nucleus Contributes to Salt-Sensitive

- Hypertension. *Am J Physiol Heart Circ Physiol* 313: H1075-H1086, 2017.
14. Larson RA, Chapp AD, Gui L, Huber MJ, Cheng ZJ, **Shan Z**, Chen QH: High Salt Intake Augments Excitability of PVN Neurons in Rats: Role of the Endoplasmic Reticulum Ca²⁺-Store. *Frontiers in neuroscience*, 11: 182, 2017.
 15. Qi X, Guzhva L, Yang Z, Febo M, **Shan Z**, Wang KK, Bruijnzeel AW. Overexpression of CRF in the BNST diminishes dysphoria but not anxiety-like behavior in nicotine withdrawing rats. *Eur Neuropsychopharmacol*. 2016 1378-1389, 2016.
 16. Huber MJ, Basu R, Cecchetti C, Cuadra AE, Chen QH, **Shan Z**. Activation of the (pro)renin receptor in the paraventricular nucleus increases sympathetic outflow in anesthetized rats. *Am J Physiol Heart Circ Physiol*. 309(5):H880-7. 2015.
 17. Larson RA, Gui L, Huber MJ, Chapp AD, Zhu J, LaGrange LP, **Shan Z**, Chen QH. Sympathoexcitation in ANG II-salt hypertension involves reduced SK channel function in the hypothalamic paraventricular nucleus. *Am J Physiol Heart Circ Physiol*. 15; 308 (12):H1547- 55. 2015.
 18. Shi P, Grobe JL, Desland FA, Zhou G, Shen XZ, **Shan Z**, Liu M, Raizada MK, Sumners C Direct pro-inflammatory effects of prorenin on microglia. *PLoS One*. 9(10):e92937 . 2014.
 19. Qi X **Shan Z**, Ji Y, Guerra V, Alexander JC, Ormerod BK, Bruijnzeel AW. Sustained AAV-mediated overexpression of CRF in the central amygdala diminishes the depressive-like state associated with nicotine withdrawal. *Transl Psychiatry*. 4: e385. 2014
 20. Zubcevic J, Jun JY, Kim S, Perez PD, Afzal A, **Shan Z**, Li W, Santisteban MM, Yuan W, Febo M, Mocco J, Feng Y, Scott E, Baekey DM, Raizada MK. Altered Inflammatory Response Is Associated With an Impaired Autonomic Input to the Bone Marrow in the Spontaneously Hypertensive Rat. *Hypertension*, 63(3):542-50. 2014
 21. **Shan Z**, Zubcevic J, Shi P, Jun JY, Dong Y, Murça TM, Lamont GJ, Cuadra A, Yuan W, Qi Y, Li Q, Paton JF, Katovich MJ, Sumners C, Raizada MK. Chronic knockdown of the nucleus of the solitary tract AT1 receptors increases blood inflammatory-endothelial progenitor cell ratio and exacerbates hypertension in the spontaneously hypertensive rat. *Hypertension*, 61(6):1328-1333. 2013
 22. Zubcevic J, Jun JY, Lamont GL, Murca Tatiane, Shi P, Carvajal JM, Lin F, Li Q, Raizada MK, **Shan Z**. NTS (pro)renin receptor (PRR)-mediated antihypertensive effect involves NF-KappaB-cytokine signaling in the spontaneously hypertensive rats. *Hypertension*, 61:622-627. 2013
 23. Agassandian K, **Shan Z**, Raizada MK, Sved AF, Card JP. C1 Catecholamine neurons form local circuit synaptic connections within the rostroventrolateral medulla of rat. *Neuroscience*, 227:247-59. 2012
 24. Verma A, **Shan Z**, Lei B, Yuan L, Liu X, Nakagawa T, Grant MB, Lewin AS, Hauswirth WW, Raizada MK, Li Q. ACE2 and Ang-(1-7) Confer Protection Against Development of Diabetic Retinopathy. *Mol Ther*, 20, 28-36. 2012
 25. Card JP, Kobiler O, McCambridge J, Ebdlahad S, **Shan Z**, Raizada M, Sved AF, Enquist L. Microdissection of neural networks by conditional reporter expression from a brainbow herpesvirus. *PNAS* 108(8):3377-82. 2011
 26. **Shan Z**, Shi P, Cuadra AE, Dong Y, Lamont GJ, Li Q, Navar LG, Katovich MJ, Sumners C and Raizada MK. Involvement of the brain (pro)renin receptor in cardiovascular homeostasis. *Circulation Research*, 107, 934-938. 2010
 27. Cuadra AE, **Shan Z**, Sumners C and Raizada MK. A current view of brain renin - angiotensin system: is the (pro)renin receptor the missing link? *Pharmacology & Therapeutics*, 27-38. 2010

28. **Shan Z**, Cuadra A, Sumners C and Raizada MK. Characterization of a functional (pro)renin receptor in rat brain neurons. *Experimental Physiology*, 93, 701-708. 2008
29. Li Q, Dinculescu A, **Shan Z**, Miller R, Pang J, Lewin AS , Raizada MK and Hauswirth WW. Downregulation of p22phox in retinal pigment epithelial cells inhibits choroidal neovascularization in mice. *Molecular Therapy*, 16, 1688-1694. 2008
30. Yao H, Zhang L, **Shan Z**, Li Y, Xu H and Qiao M. Impact of *Pseudomonas aeruginosa* gene PA1550 on its swimming and twitching motility. *Wei Sheng Wu Xue Bao*, 48, 959- 962. 2008
31. **Shan Z**, Qiao M, Xu H *et al.* The study of genes involved in swimming motility of *Pseudomonas aeruginosa*. *Front. Biol. China*, 3(4), 1-6. 2008
32. Yang H, **Shan Z**, Kim J, Wu W, Lian W, Zeng L, Xing L and Jin S. Regulatory role of PopN and its interacting partners in Type III secretion of *Pseudomonas aeruginosa*. *Journal of Bacteriology*, 189, 2599-2609. 2007
33. Li Y, Bai F and **Shan Z**. Identification of two new genes involved in swimming motility of *Pseudomonas aeruginosa*. *Acta Microbiologica Sinica*, 46, 18-22. 2006
34. **Shan Z**, Xu H, Shi X *et al.* The Investigation of genes involved in swimming motility of *Pseudomonas aeruginosa*. *Journal of Nankai University*, 39, 21-25. 2006
35. Xu H, **Shan Z**, Lin W *et al.* Study on genes involved in biosynthesis and regulation of pigments in *Pseudomonas aeruginosa*. *Acta Microbiologica Sinica*, 45, 14-18. 2005
36. Si J, Bi L and **Shan Z**, Analysis of the pathogenic bacteria causing respiratory tract infection of newborn. *Journal of Tianjin Medical University*, 11, 411-413. 2005
37. **Shan Z**, Xu X, Shi X *et al.* Identification of two new genes involved in twitching motility of *Pseudomonas aeruginosa*. *Microbiology*, 150, 2653-2661. 2004
38. **Shan Z**, Xu H, Shi X *et al.* The study of optimal conditions of electroporation in *Pseudomonas aeruginosa*. *Acta Genetica Sinica*, 31, 311-316. 2004
39. **Shan Z**, Xu H, Shi X *et al.* Study of genes Involved in twitching motility of *Pseudomonas aeruginosa*. *Acta Microbiologica Sinica*, 44, 319-323. 2004
40. Yu S, Qi W, **Shan Z** *et al.*, Study on the mutation of gyrA gene quinolone-resistant clinical isolates of *Enterobacter cloacae*. *Journal of Tianjin Medical University*, 10, 240-242. 2004
41. Yu S, Bi L, Si J, **Shan Z** *et al.* Analysis of 284 cases of senile patients suffering bronchitis. *Clinical Focus*, 17, 375-376. 2002
42. **Shan Z**, Ge G. Detection of extended spectrum β -Lactamases of 294 Enterobacteriaceae isolates. *Chinese Journal of Practical Internal Medicine*, 21, 117- 118. 2001
43. Li H, Wu H, **Shan Z** *et al.* Production, detection and control of bacterial extended spectrum β -Lactamases. *Clinical Focus*, 16, 524-525. 2001
44. Ge G, Bi L, **Shan Z** *et al.* Analysis of antibiotics resistance of Enterobacteriaceae in senile patients with lower respiratory tract infection. *Tianjin Medical Journal*, 28, 477- 479. 2000
45. Ge G, **Shan Z**, Bi L *et al.* Discussion of antibiotic application on lower respiratory tract infection. *Journal of Tianjin Medical University*, 6, 60-62. 2000
46. Ge G and **Shan Z**. Detection of extended spectrum β -Lactamases in members of the family Enterobacteriaceae. *Journal of Tianjin Medical University*, 6, 315-317. 2000

47. Wu H and **Shan Z**, Wang H. The mechanism analysis of cefuroxime-resistant *Proteus* isolated from urinary tract infection. *Chinese Journal of Laboratory Medicine*, 21, 244. 1998
48. **Shan Z**, Wang H, Wu H *et al.* The resistance analysis of pathogen isolated from urinary tract infection. *Journal of Tianjin Medical University*, 26, 303-304. 1998
49. Wang H, Wu H and **Shan Z**. An analysis of resistance to 18 antibiotics in *Bacteroides fragilis* and a study on resistant gene to clindamycin. *Chinese Journal of Internal Medicine*, 37, 444-446. 1998
50. **Shan Z**, Ji D and Qiu S. Study on reassociation kinetics of repeated sequences of DNA of *Agkistrodon* species from northeast of China. *Journal of Liaoning University (Natural Science Edition)*, 25, 273-276. 1998.
51. **Shan Z**, Bi L and Wang H. Evaluation of two methods for laboratory detection of high-level gentamicin and streptomycin resistance in Enterococci. *Journal of Tianjin Medical University*, 3, 48-50. 1997
52. **Shan Z** and Wang H. Investigation of high-level resistance of aminoglycosides of 163 Enterococcus isolates. *Tianjin Medical Journal*, 25, 611-613. 1997
53. **Shan Z**, Bi L, Wang H. Antibiotic resistance assay of 431 Enterobacteriaceae isolates. *Tianjin Medical Journal*, 25 (suppl), 6-8. 1997

SELECTED ABSTRACTS (After 2007)

Abstracts Presented at Scientific Conferences Since I Joined Michigan Tech

1. Chen X, Vanloon L, Bancker S, Chen QH, **Shan Z**, Vasopressin and Orexin System Expressions Are Altered in Response to Single Prolonged Stress in Sprague Dawley Rats. Upper Peninsula Medical Conference 2022. Poster presentation.
2. Pellizzon V, Yan X, Chen X, Gao X, **Shan Z**, Bi L, Neuroprotective effect of A novel autophagy-modulating agent in an in vitro human cell-based stroke model. Upper Peninsula Medical Conference 2022. Poster presentation.
3. Chen X, Vanloon L, Bancker S, Chen QH, **Shan Z**. Acute Stress Alters Vasopressin and Orexin System Expression in Sprague Dawley Rats. Michigan Physiological Society annual Meeting 2022, Poster presentation.
4. Bagheri R, Chen X, **Shan Z**, Abadi P.S.S.P. 3D Nano-Biohybrid Carbon Nanotube Forest for Cardiac Tissue Engineering. ASME 2022 International Mechanical Engineering Congress and Exposition (IMECE2022). Accepted.
5. Bagheri R, Kasraie M, Chen X, **Shan Z**, Abadi P.S.S.P. 3D Nano-biohybrid Carbon Nanotube Forest for Cardiac Tissue Engineering. Materials Research Society (MRS) meeting. 2022. Accepted.
6. Bagheri R, Chen X, Abbasi S, Mochalin V, **Shan Z**, Abadi P.S.S.P. Enhancement of Cardiomyocyte Maturation by Through-Thickness Electrical Stimulation and The Effect of Scaffold Materials. BMES Annual Meeting, 2022. Accepted.
7. Miodonski G, Bruning J, Johnson C, Gu M, **Shan Z**, Chen QH. Exercise Training Upregulates SK+ Channel Function in the Hypothalamic Paraventricular Nucleus (PVN) of Animals. Experimental Biology 2022. Poster Presentation.

8. Larson R, Chen X, Gu M, **Shan Z**, Chen QH. SK Channel Dysfunction in the Hypothalamic Paraventricular Nucleus Contributes to Sympathoexcitation in Dahl Salt-Sensitive Rats. *Experimental Biology* 2022.
9. Chen X, VanLoon L, Bancker S, Chen QH, **Shan Z**. Single Prolonged Stress Alters Vasopressin and Orexin System Expression in Sprague Dawley Rats. *Experimental Biology* 2022.
10. Gao H, Bigalke J, Bloch C, Chen QH, **Shan Z**. Plasma Orexin A Level is Increased in Salt-Sensitive Hypertension. *Experimental Biology* 2019.
11. Bruning J, Ghannam R, Miodonski G, **Shan Z**, Techiman S, Chen QH, Microbial Derived Short Chain Fatty-Acids and Autonomic Regulation of Cardiovascular Function. *Experimental Biology* 2019
12. Bigalke J, Chen QH, Shan Z. The Orexin System in DOCA-Salt Hypertension: Regulation of Vasopressin” Michigan Physiological Society annual Meeting 2019, oral Presentation.
13. Stelly S, Bigalke J, Shan Z. The effects of prorenin in normotensive male rat neurophysiology. Michigan Physiological Society annual Meeting 2019, Poster Presentation.
14. Jiang E, Huber MJ, Fan Y, Chen QH, **Shan Z**. PRR activation in the RVLM has different effect on sympathetic outflow in male and female Sprague Dawley Rats. *Golden Research Conference-Angiotensin*, 2018
15. Bigalke J, Chen QH, **Shan Z**. Increased PVN Orexin Signaling Contributes to Sympathoexcitation in Salt Sensitive Hypertension. *Gull Lake hypertension meeting*, 2018. (**Oral presentation**).
16. Bigalke J, Jiang E, Haska T, Chen QH, **Shan Z**. PVN Orexin Receptor 1 Knockdown Effect on Metabolism and Fluid Homeostasis. *Michigan Physiology Society annual meeting*, 2018 (**Oral Presentation**)
17. Haska T, Fan Y, Chen QH, **Shan Z**. High salt diet may stimulate fructose uptake in brain neurons and contribute to neuronal apoptosis. *Experimental Biology*, 2018
18. Bigalke J, Jiang E, Haska T, Chen QH, **Shan Z**. PVN Orexin Receptor 1 Knockdown Effect on Metabolism and Fluid Homeostasis. *Experimental Biology*, 2018.
19. LaLonde Z, Behnke JE, Chapp AD, **Shan Z**, Chen QH. L-lactate increases apoptosis in dopaminergic-like PC12 Cells. *Experimental Biology*, 2018
20. Behnke JE, Chapp AD, **Shan Z**, Chen QH. Nicotine attenuates acetate-induced increase of cytosolic reactive oxygen species in dopaminergic-like PC12 cells. *Experimental Biology*, 2018
21. Chapp AD, Schum S, Behnke JE, Huber MJ, Jiang E, Larson RA, **Shan Z**, Chen QH. Measurement of electrolytes, including acetate in various physiological samples using ion chromatography. *Experimental Biology*, 2018
22. Chapp AD, Huber MJ, Larson R, Shan Z, Zhang L, Chen QH. Aldehyde dehydrogenase inhibitor, cyanamide, attenuates ethanol induced sympathoexcitatory response in the central nucleus of amygdala. *Research Society on Alcoholism*, 2018.
23. Chapp AD, Behnke JE, Driscoll K, Fan Y, **Shan Z**, Zhang L, Chen QH. Acetate mediates ethanol toxicity in dopaminergic-like PC12 cells. *Research Society on Alcoholism* 2018.
24. Jiang E, Huber MJ, Fan Y, Zhu F, Chen Q, **Shan Z**. High salt challenge induces sympathetic activation in the PVN through activation of orexin-TNF signaling in Dahl salt sensitive rats. *Experimental Biology*, 2017.

25. Fan Y, Jiang E, Hakha T, Chen QH, **Shan Z**. Orexin A receptor activation increases CamK2 expression in PC12 cells. *Experimental Biology 2017*.
26. Hakha T, Fan Y, Jiang E, Chen QH, **Shan Z**. High salt diet plus fructose water intake induces hypertension in male SD rats after 21 days.
27. Chapp AD, Driscoll KM, Behnke J, **Shan Z**, Chen Q. Acetate, an Ethanol Metabolite Increases Neuroinflammation and Neuronal Death: Implications in Ethanol Neurodegeneration. *Experimental Biology 2017*.
28. Behnke J, Discoll KM, **Shan Z** and Chen Q. Acetate, the Metabolite of Ethanol, Increases Cytosolic Calcium and mRNA Expression Levels of EGR1 and TNF α in Dopaminergic Like PC12 Cells. *Experimental Biology 2017*
29. Chapp AD, Driscoll KM, Huber MJ, **Shan Z**, Carter J, Zhang L, Chen QH. The Excitatory and Cytotoxic Actions of Acetate on Neurons. *Research Society on Alcoholism 2017*.
30. Chapp AD, Driscoll KM, Behnke J, **Shan Z**, Zhang L, Chen Q. Chen. Acidification with Acetic Acid Activates NMDAR and Increases Central Nucleus of Amygdala Neurons with Axon Projecting to Rostral Ventrolateral Medulla. *Research Society on Alcoholism 2017*.
31. Jiang E, Huber MJ, Fan Y, Zhu F, Chen Q, **Shan Z**. High salt challenge induces sympathetic activation in the PVN through activation of orexin-TNF signaling in Dahl salt sensitive rats. *Michigan Physiology Society annual meeting, 2017 (oral presentation)*.
32. Fan Y, Jiang E, Hakha T, Chen QH, **Shan Z**. Orexin A receptor activation increases CamK2 expression in PC12 cells. *Michigan Physiology Society annual meeting, 2017 (oral presentation)*
33. Hakha T, Fan Y, Jiang E, Chen QH, **Shan Z**. High salt diet plus fructose water intake induces hypertension in male SD rats after 21 days. *Michigan Physiology Society annual meeting, 2017*
34. Huber MJ, Zhu F, Larson RA, Chen C, and **Shan Z**. Increased Brain iNOS Contribute to Salt Sensitive Hypertension in Dahl Salt Sensitive Rats. *69th High Blood Pressure Research Conference, 2016*.
35. Chapp AD, Discoll KM, **Shan Z** and Chen Q. Acetate, the Metabolite of Ethanol, Increases Neuroinflammation and Cellular Death: implications in ethanol neurodegeneration. *Experimental Biology, 2016*
36. Huber MJ, Zhu F, Li N, Chen QH, **Shan Z**. Increased expression of orexin in the PVN contributes to Dahl salt sensitive hypertension. *3rd Annual Meeting of Michigan Physiological Society 2016*.
37. Larson RA, Zhu F, Berridge S, Powdhar A, Chen Q, **Shan Z**. Increased brain proinflammatory cytokines may contributes to elevated neuronal activity in salt sensitive hypertension. *3rd Annual Meeting of Michigan Physiological Society 2016*
38. Huber MJ, Zhu F, Li N, Chen QH, **Shan Z**. Upregulation of Orexin in the Paraventricular Nucleus Contributes to Salt Sensitive Hypertension. *Experimental Biology 2016*.
39. Zhu F, Larson RA, Li N, Shi P, Chen Q, **Shan Z**. High Salt Challenge Augments Expression of Proinflammatory Cytokines and Contributes to Elevated Neuronal Activity in the Hypothalamic Paraventricular Nucleus. *Experimental Biology 2016*.
40. Chapp AD, Huber MJ, **Shan Z**, Chen QH. Intraneuronal Acidification with Acetic Acid, an Ethanol Metabolite, Increases Excitability of Central Nucleus of Amygdala Neurons with Axon Projecting to Rostral Ventrolateral Medulla (CeA-RVLM). *Experimental Biology 2016*.

41. Larson RA, Chapp AD, Huber MJ, Cheng Z, **Shan Z**, Chen QH. High salt intake augments excitability of pre-sympathetic PVN neurons through dysfunction of the endoplasmic reticulum Ca²⁺ ATPase. *69th High Blood Pressure Research Conference*, 2015.
42. Larson RA, Gui L, Chapp AW, Huber MJ, Zhu J, Cheng Z, **Shan Z**, Chen QH. Inhibition of Endoplasmic Reticulum Function in PVN by Thapsigargin Increases Neuronal Excitability and Sympathetic Nerve Activity. *Michigan Physiological Society Annual Meeting*, 2015.
43. Huber MJ, Basu R, Cecchetti C, Chen QH, **Shan Z**. Sympathoexcitation by PVN Prorenin Receptor Activation May Involve Reactive Oxygen Species and iNOS. *2nd Annual Michigan Physiological Society Meeting*, 2015.
44. Huber MJ, Basu R, Cecchetti C, Chen QH, **Shan Z**. Stimulation of the Prorenin Receptor in the Paraventricular Nucleus Increases Sympathetic Outflow in Anesthetized Rat. *Experimental Biology 2015*.
45. Huber MJ, Gui L, Chapp AD, Gu M, Zhu J, **Shan Z**, Chen QH. Sympathoexcitation by inhibition of SK channel activity in the hypothalamic PVN is attenuated by local AT1 receptor blockade. *Experimental Biology 2015*.
46. Li Y, Li L, Bernstein EK, Shen ZX, **Shan Z**, Shi P. Action of multifaceted microglia on blood pressure control. *68th High Blood Pressure Research Conference*, 2014.
47. Qi X, Yuan W, Chen QH, **Shan Z**. Activation of ER stress and inflammation by neuronal (pro)renin receptor is mediated TLR4 activation. *1st Annual Michigan Physiological Society Meeting*, 2014.
48. Larson RA, Gui L, Chapp A, Huber M, Zhu J, Chen Z, **Shan Z**, Chen GH. Inhibition of endoplasmic reticulum function in PVN by thapsigargin increased neuronal excitability and sympathetic nerve activity (SNA). *Experimental Biology*, 2014.
49. Yuan W, Qi X, Chen QH, **Shan Z**. "Stimulation of endoplasmic reticulum stress and inflammation by neuronal (pro)renin receptor is mediated by toll like receptor 4 activation. *Experimental Biology*. 2014.

Selected Abstracts Presented Before I Joined Michigan Tech (2007-2013)

50. Qi X, **Shan Z**, Ji Y, Guerra V, Alexander JC, Ormerod BK, Buijnzeel AW. Sustained AAV2/5-mediated overexpression of CRF in the central nucleus of the amygdala diminishes the dysphoric-like state associated with nicotine withdrawal in rats. *Florida Genetics 9th annual symposium, Gainesville, FL*. 2013.
51. **Shan Z**, Yuan W. Blockage Of Toll-Like Receptor 4 Inhibits Renin Stimulation Of NF-KB-Mediated Cytokine Signaling In Brain Neurons. *67th High Blood Pressure Research Conference*. 2013.
52. Qi X, **Shan Z**, Ji Y, Guerra V, Alexander JC, Ormerod BK, Buijnzeel AW. Overexpression of CRF in the central nucleus of the amygdala diminishes the dysphoric-like state associated with nicotine withdrawal in rats. American College of Neuropsychopharmacology, 52nd Annual Meeting, 2013.
53. **Shan Z**, Zubcevic Z, Joo YJ, Yuan W, Qi Y. Increased Expression of Prorenin Receptor in the NTS of Spontaneously Hypertensive Rats Maybe a Compensatory Mechanism of Hypertension. *Experimental Biology Annual Meeting*, 2013.
54. Shi P, Zhou G, Desland FA, **Shan Z**, Mohan K. Raizada, Colin Sumners; Elevated brain MCP-1 contributes to neuroinflammation in hypertension. *66th High Blood Pressure Research Conference*. 2012.

55. **Shan Z**, Zubcevic Z, Shi P, Lamont GL, Murça T, Lin F, Li Q, Katovich M, Sumners C and Raizada MK. Chronic knockdown of the NTS AT1R results in changes in blood pressure set point and exacerbates hypertension in the SHR. *66th High Blood Pressure Research Conference*. 2012.
56. Zubcevic J, **Shan Z**, Li W, Feng Y, Raizada MK, Elevated sympathetic drive to the bone marrow contributes to the inflammatory response and dysfunctional endothelial progenitor cells in the spontaneously hypertensive rat. *66th High Blood Pressure Research Conference*. 2012.
57. **Shan Z**, Zubcevic Z, Shi P, Jun JY, Dong Y, Lamont GL, Murça T, Lin F, Li Q, Katovich M, Sumners C and Raizada MK. Chronic blockade of the NTS AT1R decreases circulating endothelial progenitor-inflammatory cells ratio and exacerbates hypertension in the SHR. *Gordon Research Conference, Angiotensin*, 2012.
58. Shi P, Grobe GL, Desland FA, Rodriguez V, **Shan Z**, Richards E, Raizada MK, Sumners C Microglial-neuronal interactions in the paraventricular nucleus: a potential mechanism underlying neurogenic hypertension. *Gordon Research Conference: Angiotensin*, 2012.
59. Li Q, Verma A, **Shan Z**, Hauswirth WW, Raizada MK. Hyperglycemia Induced Methylation Changes In Genes Of Ocular Renin Angiotensin System. *Gordon Research Conference: Angiotensin*, 2012.
60. Li Q, Verma A, **Shan Z**, Raizada MK, Hauswirth WW. Prorenin and pro/renin receptor in pathogenesis of retinal Pathophysiology. *Gordon Research Conference: Angiotensin*, 2012.
61. Zubcevic J, Jun JY, Lamont GL, Murca Tatiane, Shi P, Carvajal JM, Lin F, Li Q, Raizada MK, **Shan Z**. NTS (pro)renin receptor (PRR)-mediated antihypertensive effect involves NF-KappaB-cytokine signaling in the spontaneously hypertensive rats (SHR). *Experimental Biology Annual Meeting*. 2012
62. **Shan Z**, Zubcevic J, Jun JY, Lamont GL, Murca T, Shi P, Lin F, Li Q, Raizada MK. (pro)renin receptor (PRR) mediates antihypertensive effects in the nucleus of solitary tract (NTS) of Spontaneously Hypertensive Rats (SHR). *65th High Blood Pressure Research Conference*. 2011
63. Shi P, Grobe GL, Desland FA, Rodriguez V, **Shan Z**, Richards E, Raizada MK, Sumners C. Stimulatory action of the renin-angiotensin-aldosterone system on the production of microglial derived cytokines. *65th High Blood Pressure Research Conference*. 2011.
64. Verma A, **Shan Z**, Li B, Liu X, Nakagawa T, Grant MB, Houswirth W, Xu X, Raizada MK, Li Q. Hyperglycemia induced methylation changes in genes of ocular renin angiotensin system. *AVRO Annual meeting*, 2011.
65. **Shan Z**, Lamont GL, Shi P, Lin F, Summers C and Raizada MK. Neuronal (pro)renin receptor stimulation of proinflammatory cytokines involves NF-kappa B signaling. *Experimental Biology Annual Meeting*. 2011.
66. **Shan Z**, Shi P, Dong Y, Lamont GJ, Lin F, Cuadra AE, Li Q, Sumners C and Raizada MK. Chronic reduction in paraventricular nucleus (PVN) AT1R expression by AAV-mediated transfer of a small hairpin RNA (shRNA) produces a decrease in blood pressure in spontaneously hypertensive rats. *Experimental Biology Annual Meeting*. 2011.
67. Li W, **Shan Z**, Raizada MK, Sigmund CD and Feng Y. Brain targeted (pro)renin receptor over-expression induces the development of hypertension via modulation of baroreflex

- sensitivity and renal sympathetic nerve activity in renin transgenic mice. *Experimental Biology Annual Meeting*. 2011.
68. Dong Y, **Shan Z**, Shi P, Raizada MK and Sumners C. Evidence for a depressor action of AT1 receptors in the nucleus of the solitary tract (NTS). *Experimental Biology Annual Meeting*. 2010.
 69. Lei B, Verma A, **Shan Z**, Hauswirth WW, Peng H, Raizada MK, Li Q. Over-expression of (pro)renin receptor in the retina induces breakdown of blood-retinal-barrier. *ARVO Annual Meeting*. 2010.
 64. Shi P, Dong Y, **Shan Z**, Lin F, Raizada MK and Sumners C. Central hypertonic NaCl increases cytokines in the hypothalamic paraventricular nucleus. *Experimental Biology Annual Meeting*. 2010.
 70. **Shan Z**, Shi P, Cuadra AE, Dong Y, Lamont GJ, Li Q, Seth DM, Navar LG, Katovich MJ, Sumners C and Raizada MK. Involvement of the brain (pro)renin receptor in cardiovascular homeostasis. *64th High Blood Pressure Research Conference*. 2010.
 71. Li W, **Shan Z**, Raizada MK, Sigmund CD and Feng Y. Brain targeted gene delivery of (pro)renin receptor induces development of hypertension in renin transgenic rats. *The 64th High Blood Pressure Research Conference*. 2010.
 72. **Shan Z**, Shi P, Lin F, Sumners C and Raizada MK. AAV-mediated increases in (pro)renin receptor expression in the supraoptic nucleus regulates vasopressin secretion and body fluid homeostasis. *The 63rd High Blood Pressure Research Conference*. 2009.
 73. **Shan Z**, Cuadra AE, Lin F, Sumners C and Raizada MK. Increased expression of (pro)renin receptor in the brain from the spontaneously hypertensive rat. *The 62nd High Blood Pressure Research Conference*. 2008.
 74. Li Q, **Shan Z**, Yuan L, Miller R, Lewin A, Hauswirth W, and Raizada MK. AAV-mediated gene transfer of ACE2 protects retinal vascular dysfunction in an animal model of diabetic retinopathy. *Hypertension, Joint Meeting of ESH and ISH*, Berlin, Germany, 2008.
 75. Cuadra AE, Gillies R, **Shan Z**, Jiang N, Li H, Sumners C and Raizada MK. Characterization of the rostral ventrolateral medulla (RVLM) neurons from adult rat brain in primary culture. *18th Scientific Meeting of the European Society of Hypertension*, 2008.
 76. **Shan Z**, Raizada MK. (Pro)renin receptor (PRR) expression in the spontaneously hypertensive rats (SHR) brain. *Experimental Biology Annual Meeting*. 2007.
 77. Craig BT, Sved JC. Sved AF, Raizada MK, **Shan Z** and Card JP. Catecholamine afferents to the marginal layer of rat medulla. *Experimental Biology Annual Meeting*. 2007.
 78. Card JP, Sved JC, Corbin T, Shively C, Li X, Yen JW, Raizada MK, **Shan Z** and Sved AF. Anterograde tracing of A1 and A5 efferents using phenotypically restricted lentivirus vector mediated reporter gene expression. *Experimental Biology Annual Meeting*. 2007
 79. Sun C, **Shan Z** and Raizada MK. Increased expression of apelin and its receptor APJ in the cardiovascular regulatory brain regions of spontaneously hypertensive rats. *The Endocrine Society's 89th Annual Meeting*. 2007.
 80. Card JP, Sved JC, Shively C, **Shan Z**, Raizada MK and Sved AF. Lentivirus mediated definition of the efferent projections of neurons in the A5 area. *Neuroscience*. 2007.
 81. Sved AF, Sved JC, Corbin T, **Shan Z**, Raizada MK and Card JC. Lentivirus mediated definition of the efferent projections of neurons in the A1 area. *Neuroscience*. 2007.

GENE SEQUENCES PUBLISHED IN NCBI GENE BANK DATABASE

1. Li Y, Bai F, **Shan Z**, et al., ESSION: DQ097892, 2006.
(<http://www.ncbi.nlm.nih.gov/nuccore/71897465>)
2. **Shan Z**, Xu H, Shi X et al. *Pseudomonas aeruginosa* PA68 16S rRNA gene. ACCESSION: AY521230. 2004. (<http://www.ncbi.nlm.nih.gov/nuccore/46403851>)
3. **Shan Z**, Xu H, Shi X et al. *Pseudomonas aeruginosa* PA68 PA0171 gene. Complete cds. ACCESSION: AY502957. 2004 (<http://www.ncbi.nlm.nih.gov/nuccore/46578126>)
4. **Shan Z**, Xu H, Shi X et al. *Pseudomonas aeruginosa* PA68 fimL gene. Complete cds. ACCESSION: AY502958. 2004. (<http://www.ncbi.nlm.nih.gov/nuccore/46578128>)