

CURRICULUM VITAE FORMAT  
University of Pittsburgh School of Medicine

**BIOGRAPHY**

**Name:** Bokai Zhu, Ph.D.      **Home Address:** 10150 Woodbury Dr, Wexford, PA, 15090  
**Birthplace:** Beijing, China      **Cell Phone:** 219-208-5319  
**Citizenship:** China      **Business Address:** 565, Bridgeside Point, 100 Technology Dr. Pittsburgh, PA, 15219  
**E-Mail:** BZHU@pitt.edu      **Business Phone:** 412-383-0447

---

**EDUCATION and TRAINING**

*List entries in each section chronologically*

**UNDERGRADUATE:**

<i>Dates Attended</i>	<i>Name and Location of Institution</i>	<i>Degree Received and Year</i>	<i>Major Subject</i>
2002	Peking University, China	B.S. 2006	Life science

**GRADUATE:**

<i>Dates Attended</i>	<i>Name and Location of Institution</i>	<i>Degree Received and Year</i>	<i>Major Subject</i>
2006	Pennsylvania State University State College, PA	Ph.D. 2012	Molecular Medicine Mentor: Dr. Jeffrey Peters

**POSTGRADUATE:**

<i>Dates Attended</i>	<i>Name and Location of Institution</i>	<i>Degree Received and Year</i>	<i>Major Subject</i>
2012	Baylor College of Medicine Houston, TX	Post-doc, 2017	Circadian rhythm Mentor: Dr. Bert O'Malley

---

**APPOINTMENTS and POSITIONS**

**ACADEMIC:**

<i>Years Inclusive</i>	<i>Name and Location of Institution or Organization</i>	<i>Rank/Title</i>
------------------------	---	-------------------

2017-2018	Baylor College of Medicine, Houston, TX	Instructor
2018 to present	University of Pittsburgh, Pittsburgh, PA	Assistant Professor of Medicine

### MEMBERSHIP in PROFESSIONAL and SCIENTIFIC SOCIETIES

<i>Organization</i>	<i>Year</i>
Sigma Xi	2020 to 2022
American Diabetes Association	2018 to Present
Society for Research on Biological Rhythms	2020 to Present
American Society of Cell Biology	2022 to Present

### HONORS

<i>Title of Award</i>	<i>Year</i>
Hevolution/AFAR New Investigator Awards in Aging Biology and Geroscience	2024
Pitt selection for Eastern Alliance of Digestive Disease Research Core Center junior faculty exchange program	2022
<b>NIH Director's New Innovator Award</b>	10/2020 to 09/2025
Pittsburgh Liver Research Center Pilot Research Award	04/2020 to 04/2021
W.M. Keck Foundation: Research Program 2019 Phase I finalist/Pitt Nominee	11/2019
UPMC Competitive Medical Research Fund (CMRF) Research Award	07/2019 to 07/2021
American Diabetes Association Junior Faculty Development Award	01/2018 to 12/2021
2nd place, best abstract award at Society of Toxicology Annual Meeting	2010
Graduate Fellowship in Molecular Medicine Program	2006 to 2007
Fellowship of Academic Excellence Prize in Peking University	2004 to 2005

### PUBLICATIONS

Please also see [Google Scholar](#) and [My Bibliography](#)

#### A. Peer reviewed and preprint research articles.

1. Jia M, Sayed K, Kapetanaki MG, Dion W, Rosas L, Irfan S, Valenzi E, Mora AL, Lafyatis RA, Rojas M, **Zhu B**, and Benos PV. LEF1 isoforms regulate cellular senescence and aging. *Aging Cell* (2023). DOI: <https://doi.org/10.1111/ace.14024>
2. Jia M, Sayed K, Kapetanaki MG, Dion W, Rosas L, Irfan S, Valenzi E, Mora AL, Lafyatis RA, Rojas M, **Zhu B**, and Benos PV. LEF1 isoforms regulate cellular senescence and aging. *bioRxiv* (2023). DOI: <https://doi.org/10.1101/2023.07.20.549883>

3. **Zhu B\*** and Liu S (\*corresponding author). Preservation of ~12-hour ultradian rhythms of gene expression of mRNA and protein metabolism in the absence of canonical circadian clock. *Frontiers in Physiology* (2023). DOI: <https://doi.org/10.3389/fphys.2023.1195001>
4. Singh R, Meng H, Shen T, Lumahan LEV, Nguyen S, Shen H, Dasgupta S, Qin L, Karri D, **Zhu B**, Yang F, Coarfa C, O'Malley BW, and Yi P. TRAF4- mediated nonproteolytic ubiquitination of androgen receptor promotes castration-resistant prostate cancer. *Proceedings of the National Academy of Sciences* (2023) May 8. DOI: [10.1073/pnas.2218229120](https://doi.org/10.1073/pnas.2218229120).
5. **Zhu B\*** and Liu S (\*corresponding author). Preservation of ~12-hour ultradian rhythms of gene expression of mRNA and protein metabolism in the absence of canonical circadian clock. *bioRxiv* (2023). DOI: <https://doi.org/10.1101/2023.05.01.538977>
6. **Zhu B\***, Liu S, David NL, Dion W, Doshi NK, Siegel LB, Amorim T, Andrews RE, Kumar GVR, Irfan S, Pesaresi T, Sharma AX, Sun M, Fazeli PK, and Steinhauser ML \*. (\* co-corresponding authors). Evidence for conservation of a primordial 12-hour ultradian gene program in humans. *bioRxiv* (2023). DOI: <https://doi.org/10.1101/2023.05.02.539021>
7. Scott, MR, Zong W, Ketchesin KD, Seney ML, Tseng, GC, **Zhu, B\***, McClung CA\*. (\* co-corresponding authors). Twelve-hour rhythms in transcript expression within the human dorsolateral prefrontal cortex are altered in schizophrenia. *PLoS Biology* (2023). DOI: <https://doi.org/10.1371/journal.pbio.3001688>  
[Featured in Science Daily: <https://www.sciencedaily.com/releases/2023/01/230124192559.htm>]
8. Dai T, Rosario SR, Katsuta E, Sawant Dessai A, Paterson EJ, Novickis AT, Cortes Gomez E, **Zhu B**, Liu S, Wang H, Abrams SI, Seshadri M, Bshara W, Dasgupta S. Hypoxic activation of PFKFB4 in breast tumor microenvironment shapes metabolic and cellular plasticity to accentuate metastatic competence. *Cell Reports* (2022); Dec 6;41(10):111756. doi: [10.1016/j.celrep.2022.111756](https://doi.org/10.1016/j.celrep.2022.111756). PubMed PMID: 36476868.
9. Rinsky, M., Weizman, E., Ben-Asher, HB. Eyal G., **Zhu, B.** and Levy, O. Temporal gene expression patterns in the coral *Euphyllia paradivisa* reveal the complexity of biological clocks in the cnidarian-algal symbiosis. *Science Advances* (2022). DOI: [10.1126/sciadv.abo6467](https://doi.org/10.1126/sciadv.abo6467)
10. Scott, MR, Zong W, Ketchesin KD, Seney ML, Tseng, GC, **Zhu, B\***, McClung CA\*. (\* co-corresponding authors). The ultradian transcriptome of the human prefrontal cortex and abnormalities in schizophrenia. *bioRxiv* (2022). DOI: <https://doi.org/10.1101/2022.05.26.493559>
11. Meng, H, Gonzalez, N, Jung, SY, Lu Y, Putluri N, **Zhu, B**, Dacso, CC, Lonard, D and O'Malley BW. Defining the mammalian coactivation of hepatic 12-h clock and lipid metabolism. *Cell Reports* (2022); DOI: <https://doi.org/10.1016/j.celrep.2022.110491>
12. Dion, W., Ballance, H., Lee J., Pan Y., Irfan S., Edwards, C., Sun., M., Zhang J., Zhang X., Liu S. and **Zhu, B.** Four-dimensional nuclear speckle phase separation dynamics regulate proteostasis. *Science Advances* (2022); DOI: [10.1126/sciadv.abl4150](https://doi.org/10.1126/sciadv.abl4150)  
[Featured in UPMC News Blog: <https://inside.upmc.com/cellular-tides-influence-repair-of-faulty-proteins-involved-in-age-related-diseases/>].
13. Moreno-Smith, M., Milazzo, G., Tao, L., Fekry B., **Zhu, B.**, Mohammad M., Giacomo S., Borkar R., Reddy K., Capasso M., Vasudevan S., Sumazin P., Hicks, J., Putluri N., Perini G., Eckel-Mahan K., Burris T., and Barbieri E. Restoration of the molecular clock is tumor suppressive in neuroblastoma. *Nature Communications* (2021); DOI: <https://doi.org/10.1038/s41467-021-24196-4>
14. Meng, H, Gonzalez, N, Lonard, D, Putluri N, **Zhu, B**, Dacso, CC, York, B and O'Malley BW. XBP1 links the 12-hour clock to NAFLD and regulation of membrane fluidity and lipid homeostasis. *Nature Communications* (2020); DOI: <https://doi.org/10.1038/s41467-020-20028-z>
15. Sawant Dessai A, Palestino Dominguez M, Chen UI, Hasper J, Prechtel C, Yu C, Katsuta E, Dai T, **Zhu B**, Jung SY, Putluri N, Takabe K, Zhang XH, O'Malley BW, and Dasgupta S. Transcriptional repression of SIRT3 potentiates mitochondria aconitase activation to drive aggressive prostate cancer to bone. *Cancer Research* (2020); DOI: [10.1158/0008-5472.CAN-20-1708](https://doi.org/10.1158/0008-5472.CAN-20-1708)

16. **Zhu, B.** Decoding the function and regulation of the mammalian 12h-clock. *Journal of Molecular Cell Biology* (2020); doi: 10.1093/jmcb/mjaa021
17. Gao, Y., Chen, L., Han, Y., Wu F., Yang, W., Zhang, Z., Huo, T., Zhu, Y., Yu, C., Kim H., Lee M., Tang, Z., Philips, K., He, B., Jung, S.Y., Song, Y., **Zhu, B.**, Xu, R. and Feng Q. Acetylation of histone H3K27 signals the transcriptional elongation for estrogen receptor alpha. *Communications Biology* (2020); <https://doi.org/10.1038/s42003-020-0898-0>
18. Pan, Y, Ballance, H, Meng, H, Gonzalez, N, Kim, SM, Abdurehman, L, York, B, Chen, X, Schnytzer, Y, Levy, O, Dacso, CC, McClung, CA, O'Malley BW, Liu S, **Zhu, B.** 12-h clock regulation of genetic information flow by XBP1s. *PLoS Biology* (2020); DOI: 10.1371/journal.pbio.3000580  
[Featured in UPMC News Blog: <https://inside.upmc.com/what-do-a-mouse-an-ocean-snail-and-a-sea-anemone-have-in-common/>].
19. Pan, Y., Ballance, H., Schnytzer Y., Chen X., Levy, O., Coarfa, C. and **Zhu, B.** 12h-clock control of central dogma information flow by XBP1s. *bioRxiv* (2019). DOI: <https://doi.org/10.1101/559039>
20. Antoulas, A.C., **Zhu, B.**, Zhang, Q., York, B., O'Malley, B.W. and Dacso, C.C. A novel mathematical method for disclosing oscillations in gene transcription: a comparative study. *PLoS One* (2018); 13(9): e0198503
21. Koh, E., Chernis, N., Saha, P., Xiao, L., Bader, D.A., **Zhu, B.**, Rajapakshe, K., Hamilton, M.P., Liu, X., Perera D., Chen X., York, B., Trauner M., Coarfa, C., Bajaj M., Moore, D.D., Deng T., McGuire, S.E. and Hartig, S.M. miR-30a remodels subcutaneous adipose tissue inflammation to improve insulin sensitivity in obesity. *Diabetes* (2018). DOI: 10.2337/db17-1378
22. Borland, M.G., Kehres, E.M., Lee, C., Wagner, A.L., Shannon, B.E., Albrecht, P.P., **Zhu, B.**, Gonzalez, F.J., Peters, J.M. Inhibition of tumorigenesis by peroxisome proliferator-activated receptor (PPAR)-dependent cell cycle blocks in human skin carcinoma cells. *Toxicology* (2018). DOI: 10.1016/j.tox.2018.05.003
23. Dasgupta, S., Rajapakshe, K., **Zhu, B.**, Nikolai B.C., Yi, P., Putluri, N., Choi, J.M., Jung, S.Y., Coarfa, C., Westbrook, T.F., Zhang, X.H., Foulds, C.E., Tsai, S.Y., Tsai, M.J. and O'Malley, B.W. Glycolytic enzyme PFKFB4 activates oncogenic coactivator SRC-3 to drive breast tumorigenesis and metastasis. *Nature* (2018). DOI: 10.1038/s41586-018-0018-1
24. Borland, M.G., Yao, P., Kehres, E.M., Lee, C., Pritzlaff, A.M., Ola, E., Wagner, A.L., Shannon, B.E., Albrecht, P.P., **Zhu, B.**, Kang, B., Robertson, G.P., Gonzalez, F.J. and Peters, J.M. Inhibition of melanoma tumorigenicity by PPAR $\beta/\delta$  and PPAR $\gamma$ . *Toxicological Sciences* (2017). DOI: 10.1093/toxsci/kfx147
25. Gates, L.A., Shi, J., Rohira, A.D., Feng, Q., **Zhu, B.**, Bedford, M.T., Sagum, C.A., Jung, S.Y., Qin, J., Tsai, M., Tsai, S.Y., Li, W., Foulds, C.E. and O'Malley, B.W. Acetylation on histone H3 lysine 9 mediates a switch from transcription initiation to elongation. *Journal of Biological Chemistry* (2017). DOI: 10.1074/jbc.M117.802074
26. Antoulas, A.C., **Zhu, B.**, Zhang, Q., York, B., O'Malley, B.W. and Dacso, C.C. A novel mathematical method for disclosing oscillations in gene transcription: a comparative study. *bioRxiv* (2017). DOI: 10.1101/151720
27. **Zhu, B.**, Zhang, Q., Pan, Y., Mace, E.M., York, B., Antoulas, A.C., Dacso, C.C. and O'Malley, B.W. A cell-autonomous mammalian 12 hr clock coordinates metabolic and stress rhythms. *Cell Metabolism* (2017). 25(6):1305-1319.e9. DOI: 10.1016/j.cmet.2017.05.004  
[Featured in "editors' choice" highlight in the issue of *Science* :30 Jun 2017: <http://science.sciencemag.org/content/356/6345/twil>]  
[Featured in "editors' choice" highlight in the issue of *Science Translational Medicine* :28 Jun 2017: <http://stm.sciencemag.org/content/9/396/eaan6728.full>]  
[Featured in the *Scientist* magazine: <http://www.the-scientist.com/?articles.view/articleNo/49603/title/Mammals-May-Have-a-12-hour-Clock/>].
28. Suresh, S., Durakoglugil, D., Zhou X., **Zhu, B.**, Sarah, C., Xing C., Xie X.J., York, B. and O'Donnell, K. SRC-2-mediated coactivation of anti-tumorigenic target genes suppresses MYC-induced liver cancer. *PLoS Genetics* (2017). DOI: 10.1371/journal.pgen.1006650

29. Yao, P.L., Chen, L., Dobrzański, T.P., **Zhu, B.**, Kang, B., Muller, R., Gonzalez, F.J. and Peters, J.M. Peroxisome proliferator-activated receptor- $\beta/\delta$  (PPAR $\beta/\delta$ ) inhibits human neuroblastoma cell tumorigenesis by p53- and SOX2-mediated cell differentiation. *Molecular Carcinogenesis* (2016). DOI: 10.1002/mc.22607
30. Fleet, T., Stashi, E., **Zhu, B.**, Rajapakshe, K., Marcelo, K.L., Kettner, N., Gorman, B.K., Coarfa, C., Loning, F., O'Malley, B.W. and York, B. Genetic and environmental models of circadian disruption link SRC-2 function to hepatic pathology. *Journal of Biological Rhythms* (2016). DOI: 10.1177/0748730416657921
31. Romere, C., Duerrschmid, C., Bournat, J., Constable, P., Jain, M., Xia, F., Saha, P.K., Del Solar, M., **Zhu, B.**, York, B., Sarkar, P., Rendon, D.A., Gaber, M.W., LeMaire, S.A., Coselli, J.S., Milewicz, D.M., Sutton, R., Butte, N.F., Moore, D.D. and Chopra, A.R. Asprosin, a fasting-induced glucogenic protein hormone. *Cell* (2016). DOI: 10.1016/j.cell.2016.02.063
32. **Zhu, B.**, Gates, L.A., Stashi, E., Dagupta, S., Gonzalez, N., Dean, A., Dasco, C.C., York, B. and O'Malley, B.W. Co-activator-dependent oscillation of chromatin accessibility dictates circadian gene amplitude via REV-ERB loading. *Molecular Cell* (2015) Nov 20. DOI: 10.1016/j.molcel.2015.10.024
33. Fleet, T., Zheng, B., Lin, F., **Zhu, B.**, Dagupta, S., Stashi, E., Tackett, B., Thevananther, S., Rajapakshe, K., Gonzalez, N., Dean, A., Mao, J., Malonvannaya, A., Qin, J., Coarfa, C., Demayo, F., Dasco, C.C., Foulds, C.E., O'Malley, B.W. and York, B. SRC-2 orchestrates polygenic inputs for fine-tuning glucose homeostasis. *Proceedings of the National Academy of Sciences* (2015) Oct 20. DOI: 10.1073/pnas.1519073112
34. Yao, P.L., Chen, L., Dobrzański, T.P., Phillips, D.A., **Zhu, B.**, Kang, B.H., Gonzalez, F.J. and Peters, J.M. Inhibition of human testicular embryonic carcinoma cell tumorigenicity by peroxisome proliferator-activated receptor- $\beta/\delta$  and retinoid acid receptor-dependent mechanisms. *Oncotarget* (2015) DOI: 10.18632/oncotarget.5415
35. **Zhu, B.**, Ferry, C.H., Markell, L.M., Blazanin, N., Glick, A.B., Gonzalez, F.J. and Peters, J.M. The nuclear receptor PPAR $\beta/\delta$  promotes oncogene-induced cellular senescence through repression of endoplasmic reticulum stress. *Journal of Biological Chemistry* (2014) Jul 18;289(29):20102-19
36. Stashi, E., Lanz, R.B., Mao, J., Michailidis, G., **Zhu, B.**, Kettner, N., Putluri, N., Reineke, E.L., Reineke, L.C., Dasgupta, S., Dean, A., Stevenson, C.R., Sivasubramanian, N., Sreekumar, A., DeMayo, F., York, B., Loning, F. and O'Malley, B.W. SRC-2 is an essential co-activator for orchestrating metabolism and circadian rhythm. *Cell Reports* (2014) 6 (4): 633-645
37. Yao, P.L., Morales, J.L., **Zhu, B.**, Kang, B.H., Gonzalez, F.J. and Peters, J.M. Activation of peroxisome proliferator-activated receptor- $\beta/\delta$  (PPAR $\beta/\delta$ ) inhibits human breast cancer cell line tumorigenicity. *Molecular Cancer Therapeutics* (2014) 13(4):1008-17
38. Lahoti, J., Hughes, J.M., Kusnadi, A., John, K., **Zhu, B.**, Murray, I., Gowda, K., Peters, J.M., Amin, S. and Perdew, G.H. Ah receptor antagonism attenuates growth factor expression, proliferation and migration in fibroblast-like synoviocytes from rheumatoid arthritis patients. *Journal of Pharmacology and Experimental Therapeutics* (2014) 348 (2):236-245
39. **Zhu, B.**, Ferry, C.H., Bility, M.T., Blazanin, N., Khozoie, C., Glick, A.B., Gonzalez, F.J. and Peters, J.M. PPAR $\beta/\delta$  promotes HRAS-induced senescence and tumor suppression by potentiating p-ERK and repressing p-AKT activity. *Oncogene* (2013) doi:10.1038/onc.2013.477
40. Khozoie, C., Borland, M.B., **Zhu, B.**, Baek, S., John, S., Hager, G.L., Shan, Y.M., Gonzalez, F.J. and Peters, J.M. Analysis of the peroxisome proliferator-activated receptor-beta/delta (PPARbeta/delta) cistrome reveals novel co-regulatory role of ATF4. *BMC Genomics* (2012) 13(1): 665
41. **Zhu B.**, Khozoie C, Bility, M.T., Ferry, H.C., Blazanin, N., Glick, A., Gonzalez F.J, Peters JM. PPAR $\beta/\delta$  crosstalks with E2F and attenuates mitosis in HRAS-expressing cells. *Molecular and Cellular Biology* (2012) 32:2065-2082
42. Borland MG., Khozoie C., Albrecht PP., **Zhu B.**, Lee C., Lahoti TS., Gonzalez FJ., Peters JM. Stable over-expression of PPAR $\beta/\delta$  and PPAR $\gamma$  to examine receptor signaling in human HaCaT keratinocytes. *Cellular Signaling* (2011) 23: 2039-50
43. Foreman JE., Chang WC., Palkar PS., **Zhu B.**, Borland MG., Williams JL., Kramer LR., Clapper ML., Gonzalez FJ., Peters JM. Functional characterization of peroxisome proliferator-activated receptor- $\beta/\delta$  expression in colon cancer. *Molecular Carcinogenesis* (2011) 50 :884-900

44. **Zhu, B.**, Bai, R., Kennet, M.J., Kang, B., Gonzalez, F.J. and Peters, J.M. Chemoprevention of chemically-induced skin tumorigenesis by ligand activation of peroxisome proliferator-activated receptor- $\beta/\delta$  (PPAR $\beta/\delta$ ) and inhibition of cyclooxygenase 2 (COX2). *Molecular Cancer Therapeutics* (2010) 9: 3267-77
45. Bility, M.T., **Zhu, B.**, Blazanin, N., Glick, A.B., Kang, B.H, Gonzalez, F.J. and Peters, J.M. Ligand activation of peroxisome proliferator-activated receptor  $\beta/\delta$  and inhibition of cyclooxygenase 2 (COX2) enhances inhibition of skin tumorigenesis. *Toxicological Sciences* (2010) 113: 27-36.
46. He, P., Borland, M.G., **Zhu, B.**, Sharman. A.K., Amin, S., El-Bayoumy, K., Gonzalez, F.J. and Peters, J.M. Effect of ligand activation of peroxisome proliferator-activated receptor beta/delta in human lung cancer cell lines. *Toxicology* (2008) 29: 2406-2414.
47. Girror, E.E., Hollingshead, H.E., He, P., **Zhu, B.**, Perdew, G.H. and Peters. J.M. Quantitative expression patterns of peroxisome proliferator-activated receptor beta/delta protein in mice. *Biochemical and Biophysical Research Communications* (2008) 371: 456-461.

**B. Reviews, invited published papers, proceedings of conference and symposia, monographs, books, and book chapters**

48. **Zhu, B.** Logic of the temporal compartmentalization of the hepatic metabolic cycle. *Physiology* (2022); <https://doi.org/10.1152/physiol.00003.2022>
49. Asher, G and **Zhu, B.** Beyond circadian rhythms: Emerging roles of ultradian rhythms in control of liver functions. *Hepatology* (2022); <https://doi.org/10.1002/hep.32580>
50. Ballance, H and **Zhu, B.** Revealing the hidden reality of the mammalian 12-h ultradian rhythms. *Cellular and Molecular Life Sciences* (2021); <https://doi.org/10.1007/s00018-020-03730-5>
51. **Zhu, B.**, Dacso, C.C. and O'Malley, B.W. Unveiling “Musica Universalis” of the Cell: A brief history of biological 12h rhythms. *Journal of Endocrine Society* (2018); 2(7):727-752. DOI: 10.1210/js.2018-00113
52. Peters, J.M., Kim, D.J., Bility, M.T., Borland, M.G., **Zhu, B.** and Gonzalez, F.J. Regulatory mechanisms mediated by peroxisome proliferator-activated receptor- $\beta/\delta$  in skin cancer. *Molecular Carcinogenesis* (2019); <https://doi.org/10.1002/mc.23033>

**C. Published abstracts.**

53. Yao, PL., Borland, M.G., Krishnan, P., **Zhu, B.**, Gonzalez, F.J. and Peters, J.M. Inhibition of clonogenicity and xenograft tumor growth by activation and/or over-expression of peroxisome proliferator activated receptor- $\beta/\delta$  (PPAR $\beta/\delta$ ). Presented at the American Association for Cancer Research Annual Meeting (2013)
54. **Zhu, B.**, Khozoie, C., Ferry, C.H., Markell, L.M., Bility, M.T., Blazanin, N., Glick, A.B., Gonzalez, F.J. and Peters, J.M. Anti-oncogenic role of peroxisome proliferator-activated receptor- $\beta/\delta$  (PPAR $\beta/\delta$ ) involves inhibition of mitosis and regulation of HRAS1-induced senescence. Presented at the American Association for Cancer Research Annual Meeting (2012)
55. Borland, M.G., Lee, C., Albrecht, P.P., Lahoti, T.S., **Zhu, B.**, Gonzalez, F.J. and Peters, J.M. Receptor- and ligand-dependent functions of PPAR $\beta/\delta$  and PPAR $\gamma$  on cell proliferation in the A431 human carcinoma cell line. Presented at the Society of Toxicology Annual Meeting (2012).
56. Albrecht, P.P., Balandaram, G., Ferry, C., Borland, M.G., **Zhu, B.**, Gonzalez, F.J and Peters, J.M. Effect of stable over-expression of PPAR $\beta/\delta$  in Huh7 cells. Presented at the Society of Toxicology Annual Meeting (2012).
57. **Zhu, B.**, Kang, S., Markell, L.K., Krishnan, P., Torsell, N.E., Gonzalez, F.J. and Peters, J.M. Over-expression of ubiquitin C inhibits exacerbated chemically-induced skin tumorigenesis in Ppar $\beta/\delta$ -null mice. Presented at the Society of Toxicology Annual Meeting (2012).
58. Ferry, C.H., **Zhu, B.**, Lahoti, T.S., Gonzalez, F.J. and Peters, J.M. Enhanced inhibition of cell proliferation in human colon cancer DLD1 cells over-expressing PPAR $\gamma$ . Presented at the Society of Toxicology Annual Meeting (2012).
59. **Zhu, B.**, Khozoie, C., Bility, M.B., Blazanin, N., Glick, A.B., Gonzalez, F.J. and Peters, J.M.. Anti-oncogenic role of peroxisome proliferator-activated receptor- $\beta/\delta$  (PPAR $\beta/\delta$ ) involves regulation of viral Hras1 (v-Hras1)-induced

senescence and endoplasmic reticulum (ER) stress in mouse primary keratinocytes. Presented at the American Association for Cancer Research Annual Meeting (2011).

60. **Zhu, B.**, Bility, M.T., Blazanin, N., Glick, A.B., Gonzlaez, F.J. and Peters, J.M. Peroxisome proliferator-activated receptor-  $\beta/\delta$  (PPAR  $\beta/\delta$ ) inhibits viral Hras1 (v-Hras1)-induced neoplastic/malignant transformation of mouse primary keratinocytes. Presented at the Society of Toxicology Annual Meeting (2011).
61. Palkar, P.S., Borland, M.B., Khozoie, C., **Zhu, B.**, Lee, C., Gonzalez, F.J. and Peters, J.M. Stable over-expression of PPAR $\beta/\delta$  and PPAR $\gamma$  to examine receptor signaling in human HaCaT keratinocytes. Presented at the Society of Toxicology Annual Meeting (2011).
62. **Zhu, B.**, Bility, M.T., Blazanin, N., Glick, A.B., Gonzalez, F.J. Peters, J.M. Peroxisome proliferator-activated receptor-  $\beta/\delta$  (PPAR  $\beta/\delta$ ) inhibits viral Hras1 (v-Hras1)-induced neoplastic transformation of mouse primary keratinocytes. Presented at the Society of Toxicology Annual Meeting (2010).
63. **Zhu, B.**, Bility, M.T., Blazanin, N., Glick, A.B., Kang, B.-H., Gonzalez, F.J. and Peters, J.M. Combining ligand activation of peroxisome proliferator-activated receptor- $\beta/\delta$  (PPAR $\beta/\delta$ ) and inhibition of cyclooxygenase-2 (COX2) activity exerts both chemopreventive and chemotherapeutic effects on skin tumorigenesis. Presented at the Society of Toxicology Annual Meeting (2009).

---

## PROFESSIONAL ACTIVITIES

### TEACHING: (all counts toward Education Credit Unit)

Lectures and seminars:

- Guest lecturer: CPCB seminar series. University of Pittsburgh. Sep 21st, 2018
- Guest lecturer: Medical Scientist Training Program Journal Club series, Nov 19th, 2019.
- Guest lecturer: MSMGDB 3560: Molecular Mechanisms of Longevity & Aging, Feb 2nd, 2022.

Post-docs mentored:

Heather Ballance: 2018 to 2022

Baby Anjum: 2020

Syeda Kubra: 2022 to present.

Graduate students mentored:

William Dion M.S., Integrative System Biology Graduate Program: 2020 to present. Will Dion was supported by a T32 Training Grant from the center for circadian and sleep science and is currently supported by a F31 fellowship from NIA.

Michelle Sun., Master of Science in Biostatistics Graduate Program: 2022 to present.

Haokun Wang, B.S. CBMP program, 2023 to present.

Thesis committee for graduate students:

Kaitlyn Peterson, Neuroscience Graduate Program, University of Pittsburgh: 2021 to present.

Tianyi Zhou, Biology Graduate Program, University of Houston: 2021 to present.

Ankit Sharma, Integrative system Biology Program/MSTP, University of Pittsburgh, 2023 to present.

Graduate students that did rotations in the lab:

Jiwon Lee, CPCB program, 2020

William Dion, ISB program, 2020

Margaret Champion, ISB program, 2020

Jing Zhang, IBGP program, 2021

Ramya Donepudi, ISB program, 2021

Haokun Wang, IBGP program, 2022

Undergraduate students mentored:

Jane Lee: 2020 to present, including being awarded Summer Undergraduate Research Award (SURA) fellowship from 05/2020 to 08/2020, and awarded Summer Undergraduate Research Program (SURP) fellowship from 06/2021 to 08/2021.

Claire Cheng: 2020 to 2021

Saad Irfan: 2020

Talia Piretra: 2020

Daniella Santucci: 2021 to 2023

Claire Dupont: 2022 to 2023

Nathan Ritchey: 2022 SURP student

Aishwarya Ponna: 2022 to present.

Maci Chambers: 2023 SURP student

Aryan Bangalore: 2023 SURP student

Eleanor Ickes: 2023-present

Other teaching related activities:

Joint CMU-Pitt Program in Computational Biology (CPCB) graduate students' admission committee: 2019 to 2021

Interdisciplinary Biomedical Graduate Program (IBGP) graduate students' admission committee: 2020 to present.

## RESEARCH:

1. Grant support:

### ***Current Grant Support:***

#### **Richard King Mellon Foundation**

Nuclear speckle rejuvenation to delay aging.

#### **Principal Investigator**

\$250,000 (total amount) 06/01/2023-12/31/2024

#### **NIH Director's New Innovator Award**

DP2GM140924

Decoding the regulation and functions of mammalian 12h-clock.

#### **Principal Investigator**

\$300,000/year (direct cost) 9/30/2020 – 5/31/2025

#### **National Institute of Aging**

R21AG071893



Ultradian to circadian transcriptome re-wiring underlies liver aging.

**Principal Investigator**

\$137,500/year (direct cost) 09/15/2022-05/31/2024

**National Institute of Diabetes and Digestive and Kidney Diseases**

R01DK114356-06A1

Metabolic Impacts of Type II Interferon Signals in Obesity

**Co-investigator** (Sean Hartig, PI at BCM)

\$36,240/year (direct cost for Pitt subaward) 07/01/2022–06/30/2026

**Prior Grant Support:**

**National Science Foundation (1703170)**

EAGER: Collaborative Research: Data Science Applications In Cyberphysical Systems for Health

**Co-principal investigator**

09/07/2017-08/31/2018

**American Diabetes Association Junior Faculty Development Award**

Boosting the hepatic 12h clock to prevent non-alcoholic fatty liver diseases.

**Principal Investigator**

\$138,000/year 1/1/2018-12/31/2021

**UPMC Competitive Medical Research Fund (CMRF) Research Award**

Uncovering novel mechanisms of epigenetic and metabolic regulation of mammalian 12h-clock

**Principal Investigator**

\$20,000/year 7/1/2019-6/30/2021

**Pittsburgh Liver Research Center Pilot & Feasibility Research Award**

12h-to 24h reprogramming drives NAFLD

**Principal Investigator**

\$25,000/year 9/1/2020-9/1/2021

2. Patents:

REPURPOSING PYRVINIUM AS AN EFFECTIVE THERAPEUTIC DRUG TO REDUCE TAUOPATHY, Pending

3. Seminars and invited lectureships related to your research:

- Invited Speaker, Center for Translational Environmental Health Research annual symposium: Tick Tox:” Circadian Rhythms and the Environment”. Nov 30th, 2016. Texas A&M University.
- Invited Speaker, Post-doctoral Scientific Seminar. Sep 15th, 2017. Baylor College of Medicine.
- Invited Speaker, Department of Pharmacology and Toxicology at University of Utah, Oct 31st, 2017
- Invited Speaker, Department of Integrative Biology and Physiology at University of Minnesota Medical School, Nov 13th, 2017
- Invited Speaker, Aging Institute at University of Pittsburgh School of Medicine, Nov 20th, 2017
- Invited Speaker, College of Agriculture and Life Sciences at the North Carolina State University, Feb 19th, 2018
- Invited Speaker, CPCB seminar series. University of Pittsburgh. Sep 21<sup>st</sup>, 2018
- Invited Speaker, Bridgeside Point Research Forum, University of Pittsburgh, Nov 15<sup>th</sup>, 2018.
- Invited Speaker, Pittsburgh Institute for Neurodegenerative Diseases, University of Pittsburgh, Jan 16<sup>th</sup>, 2019
- Invited Speaker, 12/12 Senior Vice Chancellor Research Seminar Series, University of Pittsburgh, Feb 8<sup>th</sup>, 2019
- Invited Speaker, Keynote speaker at University of Pittsburgh Center for Sleep and Circadian Science Retreat, April 8<sup>th</sup>, 2019
- Invited Speaker, DOME Research Seminar Series, University of Pittsburgh, Sept 25<sup>th</sup>, 2019

- Invited Speaker, First Annual "Summer Sleep and Circadian Workshop in Indispensable Methods" Workshop at Center for Sleep and Circadian Science. Aug 11<sup>th</sup>, 2020.
- Invited Speaker, University of Pittsburgh Center for Sleep and Circadian Science Sleep Grand Rounds. Jan 7<sup>th</sup>, 2021.
- Invited Speaker, University of Pittsburgh Pittsburgh Liver Research Center Seminar Series. Jan 19<sup>th</sup>, 2021.
- Invited Speaker, 2<sup>nd</sup> International Conference on Cell and Experimental Biology (CEB-2021). July 14<sup>th</sup>, 2021. Virtual presentation.
- Invited Speaker, University of Pittsburgh Department of Developmental Biology. Dec 1<sup>st</sup>, 2021. Virtual presentation.
- Invited Speaker, University of Pittsburgh Department of Biological Sciences. Jan 31<sup>st</sup>, 2022. Hybrid presentation.
- Invited Speaker, University of Oklahoma Health Science Center/Oklahoma Medical Research Foundation/Oklahoma Nathan Shock Center on Aging. Feb 4<sup>th</sup>, 2022. Virtual presentation.
- Invited Speaker, University of Pennsylvania Center for Molecular Studies in Digestive & Liver Diseases. April 21<sup>st</sup>, 2022. Virtual presentation.
- Invited Speaker, University of Pittsburgh Magee-Women's Research Institute. April 27<sup>th</sup>, 2022.
- Invited Speaker, Chinese Society for Biological Rhythms Seminar Series 2022. Sep 11<sup>th</sup>, 2022. Virtual presentation.
- Invited Speaker, Joint meeting of American Society for Cell Biology (ASCB) and European Molecular Biology Organization (EMBO) at the Special Interest Subgroup session: "Biological time control: from the discovery of fundamental principles to the development of novel experimental and theoretical approaches". Dec 3<sup>rd</sup>, 2022.
- Invited Speaker, Vascular Medicine Institute, University of Pittsburgh, Jan 18<sup>th</sup>, 2023.
- Invited Speaker. ER stress Journal Club. Sep 12<sup>nd</sup>, 2023. Virtual presentation.
- Invited Speaker. Bench-to-bedside Medical Grand Rounds. Oct 3<sup>rd</sup>, 2023. University of Pittsburgh, School of Medicine.
- Invited Speaker, 9<sup>th</sup> Annual Great Lake Nuclear Receptor Conference, Oct 19-Oct 20<sup>th</sup>, 2023. Roswell Park Comprehensive Cancer Center.
- Invited Speaker, Latin American Symposium on Chronobiology, Oct 25<sup>th</sup> to Oct 28<sup>th</sup>, 2023. Riviera Maya, Mexico.

#### 4. Other research-related activities.

Serve on the Research Grant Review Committee of American Diabetes Association's Core Research Program, 2019 to 2023.

*Ad hoc* peer reviewer for *eLife*, *Science Translational Medicine*, *Cell Reports*, *Communications Biology*, *Scientific Report*, *Cell Death & Disease*, *Molecular and Cellular Biology*, *Journal of Molecular Cell Biology*, *Journal of Steroid Biochemistry and Molecular Biology*, *Toxicological Sciences*, *Molecular Pharmacology*, *Experimental Gerontology* and *Molecular Cancer*.

*Ad hoc* Academic Editor for *PloS Biology*.

#### 5. Podcast

Tidal Rhythms Encoded Human and Animal Physiology: Bokai Zhu Discusses Ultradian Rhythms

<https://www.youtube.com/watch?v=SCtn4YDHPTI>

### **LIST of CURRENT RESEARCH INTERESTS:**

By utilizing a state-of-the-art algorithm that can identify all superimposed oscillations in an unbiased manner, Dr Zhu's lab discovered a cell-autonomous mammalian 12h-clock that runs independently from the circadian clock to regulate 12h oscillations of gene expression and metabolism (Zhu et al., *Cell Metabolism*, 2017, Antoulas et al., *PloS One*, 2018, Zhu et al., *JES*, 2018). Genes under strong 12h-clock regulation in the liver are enriched in the whole central dogma information flow process (ranging from pre-mRNA splicing, polyadenylation, RNA decay, protein translation, translocation across ER membrane, protein folding and processing in the ER and protein transport from ER to Golgi) in an XBP1s-dependent manner. Cell-autonomous 12h rhythms of gene expression can be entrained by ER and metabolic stress cues in vitro.

Intriguingly, the mammalian 12h transcriptome is also highly conserved in marine animals possessing a circatidal clock, therefore implying that mammalian 12h-clock may evolve from the ancient circatidal clock. Dr. Zhu's lab is currently investigating the regulation as well as the physiological/pathological functions of the 12h-clock, with an emphasis on its roles in maintaining hepatic metabolic homeostasis and preventing aging-associated diseases. A combination of state-of-the-art computational, biochemical, genetic, cellular, imaging and genomic approaches is currently utilized in the lab. For a detailed description of the research performed in Zhu lab, please visit <http://www.bzhulab.com>.