Shang SU Ph.D.

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Education

Tsinghua University, Beijing , CHINA **2019**
Ph. D. in biology
Tsinghua University, Beijing , CHINA **2011**
B. Sc. in biological sciences

Current Interests

My current research mainly focuses on deciphering the underlying mechanisms of tumor dormancy, tumor progression, and drug resistance in prostate cancer bone metastases and developing novel agents to target vital players involved in these biological processes. I am now using *in silico, in vitro*, and *in vivo* methods to

- investigate how different therapies affect the bone dissemination and dormancy of prostate cancer cells.
- develop PTH1R-targeting molecules to overcome enzalutamide resistance in prostate cancer.
- explore how mitochondria are involved in switching between dormancy and active proliferation of bone-disseminated prostate cancer cells.
- develop a novel and universal proteomic approach to discover druggable regulatory proteins for cancer driver genes.

Research Experiences

Laboratory of Tumor microenvironment and metastasis

The University of Toledo **2020 - Now**
Van Andel Institute **2019 - 2020**
Post-doctoral fellow *Mentor: Dr. Xiaohong Li*
Promoted to Research Assistant Professor in July 2023

Prostate cancer bone metastasis, drug resistance, and tumor dormancy

- Deciphering how bone microenvironment (mainly on osteoblast) is involved in metastasis and enzalutamide resistance of prostate cancer. We found that enzalutamide induced TGFBR2 loss in osteoblasts via PTH1R-mediated endocytosis, which in turn led to the resistance of bone-metastatic prostate cancer cells to the androgen receptor antagonist enzalutamide.
- Developing novel systems to detect and monitor tumor cell dormancy and re-proliferation. We developed a cost-effective PCR method to estimate the abundance of disseminated tumor cells across multiple organs, applied in vivo and in vitro models to recapitulate the dormancy of prostate cancer cells, and elucidated vital players in this process. We defined a unique dormancy gene signature of prostate cancer cells in the bone microenvironment and demonstrated FAK to be the key player.
- Application of virtual drug screen against gene signatures in prostate cancer bone metastases and dormancy, to repurpose or verify drugs against prostate cancer tumor growth in bone. We recently validated a potential dormancy-inducing drug PF-562271, an FAK inhibitor.

Laboratory of Cellular and Developmental Biology

Tsinghua University **2010 - 2018**
Undergraduate; Graduate *Mentors: Dr. Wei Wu, Dr. Yu Rao*

Targeted protein degradation (Proteolysis-targeting chimera, PROTAC), cell cycle regulation

- Developed small-molecule degraders of therapeutic proteins by PROTAC to overcome drug resistance.
- Integrated biochemical/cellular/fluorescence microscopic techniques to characterize the potent PROTACs.

- Discovered S/G2-phase enrichment of β-catenin/TCF transcriptional complex in colorectal cancer cells.
- Deciphered the upstream and downstream events of β-catenin/TCF enrichment to learn more on cell cycle.

Selected Awards and Honors

Selected Attendee for 2024 NCI-funded workshop on "Big Data Training for Cancer Research" (BigCARE), **with travel award.**
Selected Attendee for 2023 AACR Translation Cancer Research for Basic Scientists Workshop.
Outstanding Post-Doctoral Fellow in Cancer Biology at The University of Toledo, 2021.
Registration Award for Keystone Symposia's eSymposia on Targeted Protein Degradation: From Small Molecules to Complex Organelles, 2021.
Registration Award for Keystone Symposia's eSymposia on Tumor Metabolism and the Microenvironment, 2021.
Excellent PhD student in School of Life Sciences, Tsinghua University, 2016.
Excellent Graduate of Tsinghua University (TOP 2% among 3000 graduates), 2011.

Current Support

W81XWH-22-PCRP-EHDA 01/01/2023-12/31/2024
HT9425-23-1-0015/PC220043
DOD PCRP
Title: *A CLOUD (CRISPR-Mediated Loci-Specific Unbiased Discovery) Atlas of Regulatory Binding Proteins for Driver Genes in Prostate Cancer Bone Metastases*
Role: **Principal Investigator**

HT9425-23-PCRP-EHDA/PC230104 01/01/2024-12/31/2025
DOD PCRP
Title: *PROTAC for PTH1R to treat prostate cancer metastases*
Role: Co-Investigator (PI: Dr. Xiaohong Li)

HT9425-23-PCRP-EHDA/PC230068 04/01/2024-03/31/2026
DOD PCRP
Title: *Dabber: D-type peptide grabber for degradation of undruggable transcription factors in lethal prostate cancer*
Role: **Principal Investigator**

Scientific Publications

Total peer-reviewed publications = 9, **h-index** = 6, **Google Scholar citations** 440+.(#, co-first author)
1. Ruihua Liu[#], **Shang Su**[#], Jing Xing[#], Ke Liu, Yawei Zhao, Mary Stangis, Diego P Jacho, Eda D Yildirim-Ayan, Cara M Gatto-Weis, Bin Chen, Xiaohong Li. Tumor removal limits prostate cancer cell dissemination in bone and osteoblasts induce cancer cell dormancy through focal adhesion kinase. ***Journal of Experimental & Clinical Cancer Research***. 2023, 42: 264.
2. Yawei Zhao, **Shang Su**, Xiaohong Li. Parathyroid Hormone-Related Protein/Parathyroid Hormone Receptor 1 Signaling in Cancer and Metastasis. ***Cancers***, 2023, 15, 1982.
3. **Shang Su,** Xiaohong Li. Dive into Single, Seek out Multiple: Probing Cancer Metastases via Single-Cell Sequencing and Imaging Techniques. ***Cancers***, 2021, 13, 1067.
4. **Shang Su**[#], Jingchen Cao[#], Xiangqi Meng[#], Ruihua Liu, Alexandra Vander Ark, Erica Woodford, Reian Zhang, Isabelle Stiver, Xiaotun Zhang, Zachary B Madaj, Megan J Bowman, Yingying Wu, H Eric Xu, Bin Chen, Haiquan Yu, Xiaohong Li. Enzalutamide-induced and PTH1R-mediated TGFBR2 degradation in osteoblasts confers resistance in prostate cancer bone metastases. ***Cancer Letters*****,** 2021,525: 170-178.
5. **Shang Su**[#], Zimo Yang[#], Hongying Gao, Haiyan Yang, Songbiao Zhu, Zixuan An, Juanjuan Wang, Qing Li, Sarat Chandarlapaty, Haiteng Deng, Wei Wu, Yu Rao Potent and Preferential Degradation of CDK6 via Proteolysis Targeting Chimera. ***Journal of Medicinal Chemistry***, 2019, 62 (16), 7575-7582. (**100+** citations within 3 years)

6. Zixuan An, Wenxing Lv, **Shang Su**, Wei Wu, Yu Rao. Developing potent PROTACs tools for selective degradation of HDAC6 protein. ***Protein & Cell***, 2019, 10(8): 606-609.
7. Qiuye Zhao, Tianlong Lan, **Shang Su**, Yu Rao. Induction of Apoptosis in MDA-MB-231 Breast Cancer Cells by a PARP1-Targeting PROTAC Small Molecule. ***Chemical Communications***, 2019, 55 (3), 369-372.
8. Yajie Ding[#], **Shang Su**[#], Weixin Tang, Xiaolei Zhang, Shengyao Chen, Guixin Zhu, Juan Liang, Wensheng Wei, Ye Guo, Lei Liu, Ye-Guang Chen, Wei Wu. Enrichment of the β-catenin–TCF complex at the S and G2 phases ensures cell survival and cell cycle progression. ***Journal of Cell Science***, 2014, 127: 4833-4845.
9. **Shang Su**, Wei Wu. Regulation of target gene transcription by Wnt/β-catenin signaling. ***SCIENTIA SINICA Vitae***, 2014, 44: 1029–1042. (Invited review in Chinese)

Manuscript in Process

10. Ruihua Liu[#], Yawei Zhao[#], **Shang Su**[#], Augustine Kwabil, Prisca Chinonso Njoku, Haiquan Yu, Xiaohong Li. Unveiling cancer dormancy: intrinsic mechanisms and extrinsic forces. ***Cancer Letters***, 2024. Accepted/In Print.
11. Juanjuan Wang, Lanting Liu, **Shang Su**, Zimo Yang, Wenxing Lv, Yu Rao, Lugui Qiu, Mu Hao, and Wei Wu Simultaneous degradation of CDK4/6 and IKZF1/3 by a single PROTAC molecule promotes effective multiple myeloma inhibition. *Submitted to* ***Haematologica***.
12. **Shang Su**[#], Ke Liu[#], Jing Xing, Yawei Zhao, Ruihua Liu, Bin Chen, Xiaohong Li. Elevated mitochondrial activity is a targetable signature of prostate cancer bone metastases. *In writing. Poster presented in AACR PCa meeting.*

Presentations & Posters

Selected Podium Presentation:

1. CSHL symposium "Biology of Cancer: microenvironment & metastasis". Cold Spring Harbor, NY, USA. Title: *Enzalutamide down-regulation of TGFBR2 in osteoblasts contributes to resistance in prostate cancer bone metastasis*. 09/24/2019-09/28/2019.
2. The 2021 Larry E. Gentry Cancer Biology Fall Student Research Forum. Toledo, Ohio, USA. Title: *Elevated mitochondria activity in prostate cancer bone metastasis: Is it a new vulnerability as an actionable target*? 10/22/2021.
3. **The 2022 Larry E. Gentry Cancer Biology Fall Student Research Forum**. Toledo, Ohio, USA. Title: *Sodium-Potassium ATPase Inhibitors Suppress Prostate Cancer Metastases.* 10/11/2022.

Poster Presentation:

4. **SBUR (Society for Basic Urology Research) Annual Meeting 2021**. Title: *Osteoblasts induce prostate cancer cell dormancy via Cldn19-dependent physical contacts*. 11/04/2021-11/07/2021.
5. **12th AACR-JCA Joint Conference on Breakthroughs in Cancer Research: Translating Knowledge into Practice**. Title: *Mitochondrial hyperactivation in prostate cancer bone metastases.* 12/10/2022-12/14/2022.
6. AACR Special Conference: Advances in Prostate Cancer Research. Title**:** *Prostate cancer (PCa) cell dormancy in bone depends on physical contacts between PCa cells and osteoblasts and can be induced via FAK inhibition***.** 03/15/2023-03/18/2023.

Invited Talk

05/20/2021. Harvard University, Cambridge, MA, USA. Title*: In silico design and evaluation of PROTAC-based protein degrader–Introductory case studies.* On-line**.** Interdisciplinary Science Seminar at Center of Mathematical Sciences and Applications,
11/17/2023. University of Massachusetts Boston, Boston, MA, USA. Title: *Harnessing tumor dormancy in prostate cancer bone metastases to prevent metastatic relapse and augment therapeutic outcomes*.
03/11/2024. Louisiana State University, Baton Rouge, LA, USA. Title: *Deciphering prostate cancer bone metastases for novel therapies.*

Scientific Community Services

Reviewer: 20+ papers reviewed for 15+ SCI-indexed journals since 2021.
2021 – Now, *Chinese Journal of Cell Biology; Molecular and Cellular Endocrinology; PeerJ.*
2022 – Now, *BioMed Research International*; *Cancers; Cancer Letters*; *Cells*; *Genes and Diseases; International Journal of Environmental Research and Public Health*; *Journal of Oncology*; *Tomography*; *ACS journals* (Approved with certificate); *Frontiers journals (Invited into the pool).*
2023 – Now, *Current oncology; Pharmaceutics; Frontiers in Drug Discovery; Cell & Bioscience; eLife; Prostate Cancer and Prostatic Diseases.*
Editor:
2022 – Now Guest Editor for Frontiers in Drug Discovery. Lead the Research Topic "Discover and Design: Emerging Targeted Protein Degradation (TPD) Approaches and Modalities for Cancer Treatment".
2023 – Now Guest Associate Editor for Frontiers in Immunology

Teaching/mentoring Experiences

I have mentored 10+ junior members in my PhD/post-doc labs. They come from different countries in different ethnical groups (Chinese, American, Bangladesh, Ghana, etc.) and span across different educational backgrounds (high school to junior PhD candidates), One of my recent mentees, a volunteer research technician, now gets admitted into the Cancer Biology PhD program of the University of Toledo.
2016 – 2018, Mentor for first-year master's and PhD students.
2019 – 2020, Mentor for summer intern at Van Andel Institute.
2019 – 2020, Group Leader for High School Journal Club in Van Andel Education Institute.
2019 – 2020, Instructor for Internal Seminar Course at Graduate School of Van Andel Institute.
2022, **Judge** for ABRCMS ePoster Symposium hosted by the American Society of Microbiology.
2021 – Now, Mentor for rotation students and junior PhD students.
2023 – Now, Tutor for basic R programming workshop in the lab.
2024, **Judge** for Graduate Research Annual Forum, College of Medicine & Life Sciences, U Toledo.