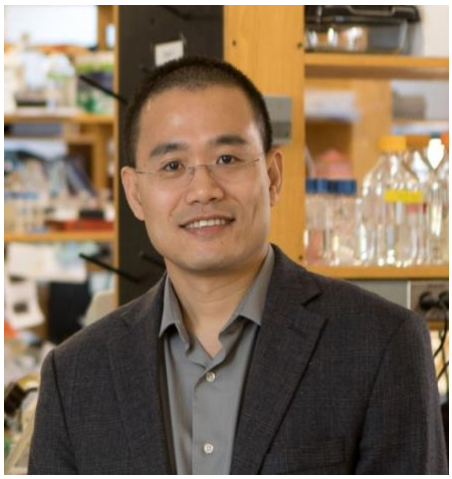
Journal of Life Sciences
a Postdoc Communitiy Initiative
ISSN 2688-1020

Mentor-Postdoc Spotlights Series 2026



Dr. Yibin Kang
Warner-Lambert/Parke-Davis Professor of Molecular Biology, Princeton University, Princeton, NJ 08544.
ykang@princeton.edu

With over 3 decades of deep involvement in research and more than 220 publications Dr. Kang's research program is currently focused on reducing and ultimately eliminating the morbidity and mortality associated with metastatic breast cancer.

Dr. Kang's research interests grew deep after earning his PhD in Genetics at Duke University, under the mentorship of Dr. Bryan R. Cullen. His dissertation focused on the transcriptional and post-transcriptional regulation of eukaryotic gene expression, using retroviruses as model systems to define mechanisms of RNA processing, nuclear export, and gene regulation. His dissertation was titled: *Tap, a novel human sequence-specific nuclear mRNA export factor*.

Dr. Kang later joined Dr. Joan Massagué group as a postdoctoral trainee at the Memorial Sloan Kettering Cancer Center in New York. His postdoctoral research focused on the functional genomic analysis of breast cancer metastasis, with particular emphasis on the role of TGF beta signaling in tumor progression and organ specific metastasis. During this period, Dr. Kang helped establish key experimental and conceptual frameworks for understanding how signaling pathways regulate metastatic dissemination and organ-specific colonization, work that laid the foundation for his independent research program on metastatic niches, tumor plasticity, and stress adaptive mechanisms in cancer.

Over the past two decades, Dr. Kang's research program has been working on metastatic breast cancer. This long-term commitment has shaped a comprehensive and highly integrated body of work that spans the full biological continuum of breast cancer progression, from mammary gland cell fate regulation and epithelial-to-mesenchymal transition (EMT) during early invasion, to metastatic colonization of distant organs and the emergence of treatment resistance. Across these stages, Dr. Kang has emphasized an integrated view of metastasis as a dynamic process shaped by cellular plasticity, stromal interactions, immune regulation, and metabolic adaptation.

Journal of Life Sciences
a Postdoc Communitiy Initiative
ISSN 2688-1020

Main highlights of Dr. Kang's research:

Organ Tropism of Metastasis and Metastatic Niches

A major contribution of Dr. Kang's laboratory is the foundational characterization of organ tropism in breast cancer metastasis, particularly to bone and other vital organs. His group pioneered functional genomic approaches to systematically identify metastasis genes, defined critical stromal components of metastatic niches, and elucidated how TGF beta, Notch, and Wnt signaling pathways govern metastatic seeding, dormancy, and outgrowth. Notably, his laboratory identified iron-recycling macrophages in the bone marrow as a specialized metabolic niche hijacked by metastatic tumor cells, linking metastatic growth to systemic complications such as anemia. These studies established core principles by which disseminated tumor cells adapt to distinct organ microenvironments and exploit niche-derived signals to support long-term survival and expansion.

Cellular Plasticity, EMT, and Stemness

Beyond organ tropism, Dr. Kang has made significant advances in understanding cellular plasticity, EMT, and stemness regulation in breast cancer. His work elucidated how EMT programs are dynamically and reversibly engaged during tumor invasion, dissemination, and metastatic seeding, and how these programs intersect with mammary gland stem cells and breast cancer stem cells. These studies revealed how niche-derived cues regulate stem-like states during tumor initiation and metastatic progression, particularly under oncogenic, metabolic, and therapeutic stress, establishing plasticity as a central driver of metastatic competence.

Cancer Fitness Genes and Therapeutic Targeting of Metadherin

A central conceptual contribution of Dr. Kang's research is the definition and therapeutic exploitation of *cancer fitness genes*. His laboratory identified Metadherin (MTDH) as a prototypical cancer fitness gene that is dispensable for normal tissue homeostasis, not oncogenic on its own, but essential for tumor initiation, metastatic progression, immune evasion, and treatment resistance under stress. Through integrated genetic, biochemical, and structural studies, Dr. Kang elucidated the molecular mechanisms of MTDH function and established the MTDH–SND1 complex as a druggable vulnerability. Building on these insights, his group has developed multiple therapeutic strategies, including inhibitory peptides, antisense oligonucleotides, and first-in-class small molecule inhibitors that suppress metastatic progression and enhance therapeutic responsiveness, providing a clear translational path for targeting cancer fitness dependencies.

Tumor Immunology and Metabolism in Metastatic Progression

Dr. Kang has also made important contributions at the intersection of tumor immunology and metabolism, particularly in defining mechanisms of immune suppression in metastatic cancer. His laboratory identified retinoic acid metabolism as a critical immunoregulatory pathway within the tumor microenvironment and

Journal of Life Sciences
a Postdoc Communitiy Initiative
ISSN 2688-1020

developed first-in-class inhibitors targeting ALDH1A2 and ALDH1A3. These studies revealed that retinoic acid signaling functions as an intrinsic brake on dendritic cell maturation and antitumor T cell responses. Pharmacologic inhibition of ALDH1A2/3 enhances immune activation, improves the efficacy of cancer vaccines and immunotherapy, and extends therapeutic relevance to systemic metabolic diseases such as diabetes.

Together, Dr. Kang's research integrates fundamental mechanisms of metastasis with immune regulation, metabolic adaptation, and therapeutic innovation. By coupling deep biological insight with sustained translational efforts, his program continues to define new strategies aimed at improving outcomes for patients with metastatic breast cancer and related systemic diseases.

Most important recent publications:

Chakrabarti R, Choudhury A, Peng J, Hwang J, Hang X, Wei Y, Grady JJ, DeCoste C, Gao J, Van Es J, Aifantis I, Clevers H, and Kang Y. (2018) Dll1-mediated macrophageal niche for mammary gland stem cells. Science, 360(6396). pii: eaan4153. doi: 10.1126/science.aan4153. PMCID: PMC7881440

Shen M, Smith HA, Wei Y, Jiang Y-Z, Zhao S, Wang N, Rowicki M, Tang Y, Hang X, Wan L, Shao Z- M, Kang Y. (2022) Pharmacological disruption of the MTDH–SND1 complex enhances tumor antigen presentation and synergizes with anti-PD-1 therapy in metastatic breast cancer. Nature Cancer, 3(1):60-74. PMCID: PMC6556210

Han Y, Sarkar H, Xu Z, Lopez-Darwin S, Wei Y, Hang X, Liu F, Tran K, Wang W, Miller JM, DeCoste CJ, Blohm D, Satcher RL, Zhang XH-F, Kang Y. (2025) Niche macrophages recycle iron to tumor cells and foster erythroblast mimicry to promote bone metastasis and anemia. Cell, 188(22):6335-6354. PMCID: PMC12416760

Fang C, Esposito M, Hars U, Byrne RT, Song B, Huang J, Roichman A, Shue L, Cheng X, Proudfoot J, Zhao D, Wei Y, Cristea IM, Rabinowitz JD, Kang Y. (2025) Targeting autocrine retinoic acid signaling by ALDH1A2 inhibition enhances anti-tumor dendritic cell vaccine efficacy. Nature Immunology, in press.

Dr. Kang's words of advice for postdocs: *"Choose questions that truly matter and commit to them with patience and rigor. Use your postdoctoral training to develop a clear scientific identity that reflects your intellectual creativity and independence. Equally important, seek mentors and collaborators who challenge your thinking and expand your technical and conceptual horizons, and remember that resilience, integrity, and long-term vision are as essential to success as talent and ambition".*

Journal of Life Sciences
a Postdoc Communitiy Initiative
ISSN 2688-1020

Dr. Yujiao Han obtained her PhD from the Shanghai Institute of Biochemistry and Cell Biology, Chinese Academy of Sciences, Shanghai, China, under the tutelage of Dr. Weiguo Zou.

Her dissertation was titled "*The role of LKB1 in CTSK positive periosteal cells and in vivo screening of bone development regulators"*.

With over 13 years of research experience and 13 publications to her credit, Dr. Han is currently a postdoctoral fellow in the Kang's group at Princeton.

In line with *JoLS-Pub*'s mission of publishing layman summaries of peer-reviewed research findings, a brief of her research outcomes was published in the February issue of *JoLS-Pub*