Research Statement

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RESEARCH ACCOMPLISHMENTS

A mechanism, established end to end. My doctoral work asked why combining two agents suppresses metastatic breast cancer when neither does so alone. I answered it by measuring what changed inside the cell. Using Western blot, RT-qPCR, ELISA, flow cytometry, immunofluorescence and immunohistochemistry, I showed the combination acted along three independent routes at once: it induced **apoptosis**, blocked **epithelial–mesenchymal transition** — the programme by which carcinoma cells acquire the motility to leave a primary site — and blocked **vasculogenic mimicry**, in which tumour cells build their own perfusion channels and so evade therapies aimed at normal vessel formation. Closing all three produced suppression of both primary growth and lung metastasis in murine models. Published in *Acta Pharmacologica Sinica* 46(12):3314–3326, **joint first author, equal contribution formally recorded**.

The delivery problem that made it possible. The two agents — shikonin, which inhibits PKM2 and suppresses tumour glycolysis, and JQ1, a BET bromodomain inhibitor — have incompatible solubility and release requirements and cannot simply be co-administered and expected to reach the same cell in a fixed ratio. I designed a mesoporous polydopamine-based Pickering emulsion carrying both in one particle, characterised by DLS, zeta potential, TEM, SEM, HPLC and UV–Vis, and later incorporated it into a thermosensitive hydrogel for placement at the resection site.

In vivo work, run independently. Study design and endpoint definition, institutional animal ethics approval, dosing and route selection, longitudinal monitoring across multi-arm cohorts, biodistribution, terminal tissue collection, histopathology and organ-toxicity assessment — carried from hypothesis through mechanism to animal proof of concept without the work changing hands.

Record. Seven peer-reviewed publications, 324 citations, h-index 3 (Google Scholar, July 2026); three as first or joint first author, including a first-author review in *Drug Delivery and Translational Research* on nanocarrier modulation of the tumour immune microenvironment. One filed Indian patent (App. No. 202421042057), taken from concept through in vitro efficacy and in vivo safety evidence to filing. Funded throughout by the ANSO Young Talent and Belt and Road Government Fellowships.

RESEARCH INTERESTS, AND HOW THEY MEET THIS PROJECT

The thread through my work is **how changes in gene and protein expression produce a change in what living tissue actually does**, and how to prove that link rigorously rather than correlatively. I have pursued that question in cancer; how expression generates rhythms in the excitability and plasticity of clock neurons is the same class of problem in a system I have not yet worked in.

Three things I would bring from the first month: fluency in the expression and imaging techniques on your list; independent capability in murine in vivo work, including its operational and welfare demands; and experience designing multi-arm studies whose controls survive review.

Two things I would be learning, and I would rather state them than let them be discovered: **stereotaxic surgery and slice electrophysiology**, manual skills requiring months of supervised practice, and the **circadian literature**, which I would be reading rather than teaching. Single-cell and bulk RNA sequencing would be new as platforms, though the experimental logic behind them is one I already work in.

Longer term I am interested in how the **timing** of an intervention changes its effect — a question my own field is only beginning to take seriously, and one this laboratory is positioned to answer properly.