CANCER PREVENTION & RESEARCH INSTITUTE OF TEXAS

Award ID:
RP150656

Project Title:
Engineered Bone Targeting Nanomedicine for Treatment of Bone Metastases from Breast Cancer

Award Mechanism:
High Impact/High Risk

Principal Investigator:
Liu, Xinli

Entity:
Texas Tech University Health Sciences Center

Lay Summary:

Breast cancer displays a very high tendency to metastasize to bone. More than 2 out of 3 patients with advanced metastatic breast cancer will develop bone metastasis; this is the major cause for severe pain, bone fractures, decreased mobility, and rapid deterioration in quality of life for patients. At present there is essentially no cure for bone metastases. Bone metastasis is a complex process involving cancer cells as well as their microenvironment in the host tissue such as bone. In this proposal, we are building new scientific synergies between nanotechnology and novel combination therapeutics, creating a two-stage bone-targeting nanomedicine containing chemotherapeutics and microRNA bone modulating agent to simultaneously inhibit tumor cell growth and bone degradation. The stage one nanomedicine is designed to exhibit superior bone adhesion and accumulation during navigation through the systemic circulation. Once locate at bone microenvironment where metastases resides, the stage two nanomedicine will form a local deport to deliver the combination therapeutics selectively to the bone-degrading cells and tumor cells. The nanomedicine will potentially confer dual cancer-fighting powers by eradicating metastatic tumor cell burdens, reducing bone lesions, and alleviating bone pain. We will first engineer and optimize the two-stage nanomedicine, then we will determine the therapeutic efficacy of the nanomedicine to reduce skeletal tumor burden and inhibit bone lesions in breast cancer bone metastasis mouse models. The animals will be injected with breast cancer cell line that has a high tendency to settle in the bone. We will start the nanomedicine treatment and use the optical and X-ray imaging techniques to monitor the tumor response. If successful, we have the potential to introduce to clinicians a nanoplatform to deliver the molecular targeted agents and bone modulating agents to combat the bone metastases.