Docket #: S24-427

Prevention and Treatment of Cardiovascular Complications Due to Chemotherapy

Stanford scientists have discovered a novel approach to address cardiovascular complications resulting from cancer chemotherapy, particularly those caused by tyrosine kinase inhibitors (TKIs). This technology focuses on restoring endothelial function that becomes impaired during chemotherapy, preventing hypertension and subsequent cardiac dysfunction. Testing in preclinical models shows promising results for both prevention and treatment of chemotherapy-induced cardiovascular complications without interfering with cancer treatment efficacy.

Cancer patients receiving TKIs frequently develop cardiovascular complications, with up to 68% experiencing hypertension that can progress to heart failure and other serious cardiac conditions. While TKIs have improved cancer survival, their cardiovascular side effects significantly impact patients' quality of life and long-term outcomes. Current management approaches either interrupt cancer treatment or provide inadequate cardioprotection. These complications stem from disruption of endothelial cell function in blood vessels, creating an imbalance in vascular regulation. Understanding the specific mechanotransduction pathways in endothelial cells has revealed promising targets for intervention that may prevent these cardiovascular complications without interfering with cancer treatment.

Activation of specific mechanosensitive ion channels in endothelial cells resulted in prevention of TKI-induced hypertension and significant protection against cardiac dysfunction in both cellular and animal models during chemotherapy. The technology shows promise not only in preventing TKI-induced hypertension but also in averting long-term cardiac complications like heart failure. This approach offers significant advantages over current management strategies as it addresses the underlying mechanism of cardiovascular toxicity rather than simply treating

symptoms, and importantly, it does not interfere with the anti-cancer efficacy of TKI therapy. This discovery represents a potential breakthrough for cancer patients, offering a way to maintain life-saving chemotherapy while protecting cardiovascular health.

Stage of Development:
Research – *in-vivo* data

Applications

- Prevention and treatment of cardiovascular complications in cancer patients receiving tyrosine kinase inhibitors
- Cardioprotective therapy during cancer treatment
- Management of TKI-induced hypertension without interrupting cancer therapy
- Prevention of long-term cardiac dysfunction in cancer survivors

Advantages

- Addresses the underlying mechanism of cardiovascular toxicity rather than just treating symptoms
- Does not interfere with the anti-cancer efficacy of chemotherapy
- Potential for simultaneous cancer treatment and cardioprotection
- May improve treatment adherence and patient quality of life by reducing cardiovascular side effects
- Single therapeutic approach that addresses both acute (hypertension) and chronic (heart failure) cardiovascular complications

Publications

- Amit Manhas et al. "Multiscale profiling of tyrosine kinase inhibitor cardiotoxicity reveals mechanosensitive ion channel PIEZO1 as cardioprotective." *Sci. Transl. Med*.17,eadv9403(2025).

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