Novel ALDH Inhibitor as an Anticancer Agent

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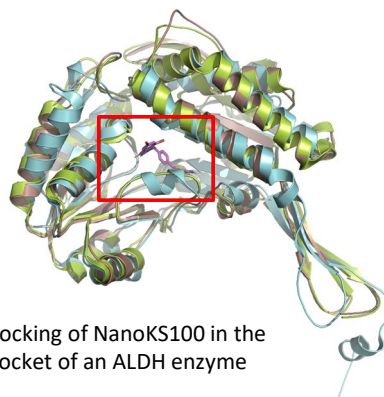
Intellectual Property:

Pending Applications:

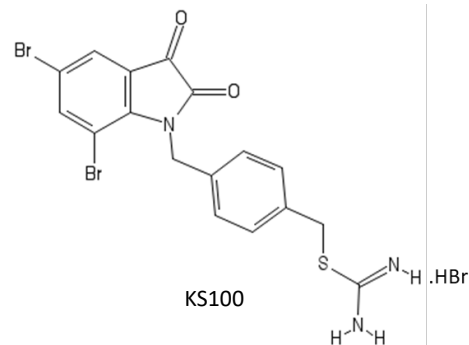- PCT/US2020/029292
- U.S. Provisional 63/037,328

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Molecular docking of NanoKS100 in the active site pocket of an ALDH enzyme

KS100

Clinical Need:

The aldehyde dehydrogenases (ALDHs) are a family of detoxifying enzymes that are commonly overexpressed in various cancers. Increased expression of ALDH is associated with poor prognosis, stemness, and drug resistance. While several ALDH inhibitors are known, few have broad spectrum activity and fewer yet have been evaluated in a clinical study for cancer therapy.

Value Proposition:

To improve cancer therapy through use of a broad-spectrum ALDH inhibitor that directly targets stem cell-like cancer cells as a monotherapy or in combination with known targeted therapeutics or checkpoint inhibitors.

Technology Solution:

Penn State researchers have developed a novel, broad-spectrum, small molecule ALDH inhibitor, KS100. Enzymatic IC50s of KS100 were 207, 1,410 and 240 nM towards ALDH1A1, 2 and 3A1, respectively. The systemic toxicity of KS100 was mitigated by development of a stable nanoliposomal formulation, NanoKS100. NanoKS100 is 5-fold more selective for killing melanoma cells as compared to normal human fibroblasts. NanoKS100 administered intravenously was effective at inhibiting tumor growth by ~65% without organ-related toxicities in xenograft mouse melanoma models. Recent experimental data demonstrates synergism of NanoKS100 with targeted and immune therapies to reduce tumor volume and drug resistance.

Market Opportunity:

In 2020, drug sales for treatment for melanoma, colon cancer and multiple myeloma (initial targets for NanoKS100) will exceed $25B. The market for advanced melanoma treatment is dominated by immune checkpoint inhibitors which are expected to reach sales of over $50B by 2025. There is significant market potential for NanoKS100 in the treatment of various cancers either as a monotherapy or in combination with current therapeutics.

Path Forward:

Continue lead optimization studies, including standard PK/PD and toxicity studies; expand investigation of combination with immunotherapies, including PD-1 and PD-L1 checkpoint inhibitors, and targeted therapies, including BRAF inhibitors. Develop a preclinical-to-IND plan.