TEXAS STATE UNIVERSITY

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# Photoactivatable Cancer Prodrug

*Discovery and development of photoactivatable chemotherapy using 7–deazahypoxanthine-based anticancer agents*


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**Field**
Photodynamic therapy (PDT)
Photocaging, Targeted drug delivery

**Technology**
Photoactivated chemotherapy, 7-deazahypoxanthine, tubulin

**Key Features**
•Minimally Invasive
• Spatially accurate and can reach sites where surgery is impossible
• Suited for Skin, Lung & GI cancers as source of light can be easily directed on the tumors

**Stage of Development**
Proof-of-concept studies

**Status**
Seeking commercial development and/or licensing partner

**Patent Status**
PCT Application filed (**October 2017**)

## *Background*

The drug delivery technology currently being developed seeks to solve the problem of achieving site-specific drug release of predetermined doses at pre-defined times. The photodynamic therapy (PDT) provides a solid foundation for inspiring this new strategy for treating tumors. In PDT, nontoxic photosensitizers are activated by light to locally generate short-lived reactive oxygen species (ROS), such as singlet oxygen (SO), to ablate cancer cells while causing only minimal side effects. The primary factor for the selective tumor ablation is the focused irradiation on tumors. However, PDT is fundamentally limited by the need for oxygen, whose concentration is low in solid cancers, often less than 4%. In the new technology, the photochemical release of caged antiproliferative agents does not rely on cellular oxygen and can thus be a more promising method to treat solid tumors.

## *Technology & Competitive Advantage*

Inventors at Texas State University have developed a successful application of the photocaging methodology to 7-deazahypoxanthine-based anticancer agents. Specifically, the invention consists of transforming the systemic chemotherapy with 7-deazahypoxanthines into photoactivatable chemotherapy for the controlled release of these toxic agents selectively into tumor tissue upon irradiation with light under hypoxic conditions. This strategy permits keeping the systemic concentration of the drug lower than its toxic level while increasing the drug concentration at tumor sites above the effective concentration potentially minimizing side effects of the treatment. In addition, the ruthenium-based caging agent significantly increases the water solubility of the drug in the dark.

## *Opportunity*

The main utility is in cancer treatment with minimal toxicity to normal tissues and enhanced effectiveness in eradicating cancer cells. There are some known photoactivated chemotherapy strategies but no single drug based on this approach has been approved for the treatment of cancer. This proof-of-principle study demonstrates that caged 7-deazahypoxanthines are excellent photoactivatable prodrugs because they are only weakly active against cancer cells in vitro. However, photorelease of 7-deazahypoxanthines from their prodrugs using green light results in dramatic increase of cytotoxicity and could be the basis for highly selective photoactivated chemotherapy. The advanced and targeted drug delivery market is forecasted to grow at a 10.4% CAGR to $319 billion by 2021 from $168 billion today.