Selective Destruction of Cancer Cells by Mitochondria-Targeting Dyes

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The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a strategy of cancer photochemotherapy that utilizes derivatives of triarylmethane dye to infiltrate and purge or inhibit tumor cells.

OVERVIEW

It has been widely observed that carcinoma membranes exhibit higher electric potentials—more than 60mV—than normal cells. This characteristic means that certain positively charged, or cationic, dye molecules can be driven into diseased tissue and accumulate in cell mitochondria. When exposed to certain wavelengths, the light-activated dyes become toxic to their hosts, triggering cell death or inhibition. Normal cells, able to excrete the dye more efficiently, are largely spared.

The uptake and retention of the toxic compounds by cancer mitochondria is a process not fully understand, and photochemical therapy targeting these structures has been constrained as a result. Moreover, certain dyes perform unreliably across different cell lines. A fresh approach, exploiting an effective and established compound, is needed.

THE INVENTION

UW–Madison researchers have developed a method of selectively treating cancer using triarylmethane derivatives as light-sensitive chemotherapeutic agents.

Crystal violet, a cationic triarylmethane (TAM+) dye, has been used extensively as a safety agent in blood transfusions, the treatment of burn patients and as an umbilical cord antiseptic. It has also shown promise as a phototherapeutic agent capable of killing cancer cells. The new treatment involves contacting cancer cells with a TAM+ derivative and exposing them to radiation, resulting in their destruction or inhibition.

Additionally, a mixture containing both malignant and non-malignant cells may be contacted with a TAM+ dye and the combination exposed to radiation, purging the malignant cells from the mixture. In this way the method facilitates the removal of diseased cells from bone marrow grafts before transplantation within a cancer patient.
APPLICATIONS

• Photochemotherapy for neoplastic diseases
• Mitochondrial targeting
• Autologous grafts requiring pre-implantation purging of cancer cells
• Tumor detection and imaging applications

KEY BENEFITS

• Promises to inhibit the growth and spread of cancer cells
• Kills cancer cells selectively
• Low toxicity toward normal cells
• Derivatives may destroy or inhibit the growth of solid tumors, such as those associated with adenocarcinoma and uterine sarcoma.
• Compounds are well suited for photodynamic therapy because absorbance maxima is in near-infrared region, which penetrates tissue better than visible light.

ADDITIONAL INFORMATION

Tech Fields
Pharmaceuticals & Vitamin D - Oncology & hematology

CONTACT INFORMATION

For current licensing status, please contact John Nagel at inagel@warf.org or (608) 265-7956.