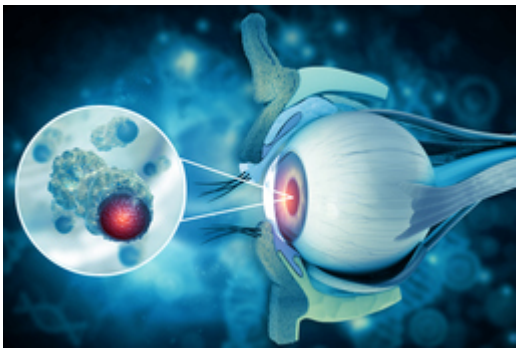
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Carbon Nanotubules for Delivery of the Ocular Drugs

TECHNOLOGY NUMBER: 2019-427



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Category
Therapeutics and Vaccines
Life Sciences

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OVERVIEW

Carbon nanotubes with selective delivery to intraocular tumors for imaging and therapy

- Able to penetrate through a retinoblastoma tumor in a mouse model
- Utilizes the biocompatible and payload carrying capabilities of CNTs

BACKGROUND

The eye is a unique organ due to its anatomic location and globe-shaped structure with a vitreous cavity inside and both retinal plus choroid layers on its wall. This unique anatomical location and structure make intravitreal injections an ideal targeted treatment for some eye conditions. One of the problems with intravitreal injections is that these medications might not penetrate fully the intraocular layers or tumors. Intraocular tumors like retinoblastoma are traditionally difficult to treat, though direct targeted injections of drugs and imaging agents into the eye may yield a novel approach for treatment of this disease.

Carbon nanotubes (CNTs) are tubular structures composed of hexagonal arranged carbon atoms with nanometer diameters and high-capacity graphene cavities that can accommodate small molecules and fluorescent loading. Various mechanical, electrical, and optical properties of CNTs make them suitable for various therapeutic and diagnostic applications. CNTs are biocompatible and have reduced or lack of immunogenicity. Previous studies have shown the ability of CNTs to improve the efficacy of drugs like cisplatin and docetaxel as they target cancer cells throughout the body. A need exists to determine whether CNTs may be employed to treat intraocular tumors, as well.

INNOVATION

Researchers at the University of Michigan have shown that carbon nanotubules are able to penetrate through a transgenic retinoblastoma tumor when injected intravitreally in a transgenic retinoblastoma mouse model. This technology utilizes the biocompatible and payload carrying capabilities of CNTs to selectively deliver therapeutics and imaging agents directly into intraocular tumors such as retinoblastoma. Proof-of-concept studies demonstrated that CNTs conjugated with a fluorophore and targeting ligands with well-established ligands for targeting cancer cells, such as biotin and folic acid, were able to penetrate retinoblastoma tumors in mouse eyes. With a growing focus on targeted delivery of imaging and therapeutic agents in oncology, this technology holds potential to help move the field forward. This technology possesses high potential for collaborative approaches to improving accuracy and efficacy of diagnostic and therapeutic agents.