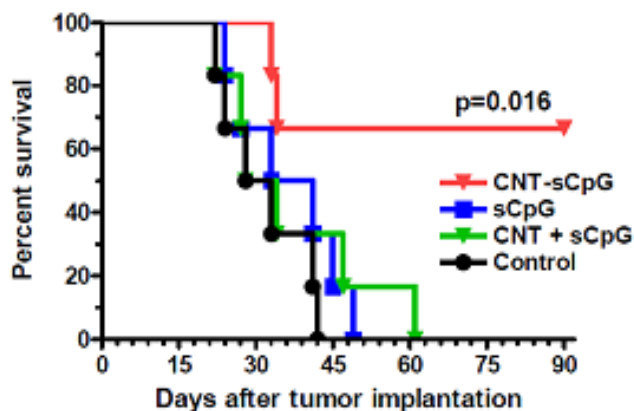


CpG Delivered Using Carbon Nanotubes to Treat Brain Cancer



DESCRIPTION

Intracranial gliomas are brain tumors that are rarely curable and associated with extremely low survival rates beyond the first year or two after diagnosis. The body's innate protections against cancer are impeded by the brain's "immune-privileged" status that blocks penetration of activated inflammatory cells into the central nervous system. Furthermore, pharmaceutical treatment of gliomas is ineffective given the blood-brain barrier's capacity to prevent chemotherapeutic drugs from entering the CNS interstitial space.

TLR9, a protein responsible for activating innate immunity in the presence of pathogens, can be activated by CpG oligodeoxynucleotides, which are short, synthetic, single-stranded DNA molecules that bear similarity to bacterial DNA. Treatment with CpGs has been shown to induce a TLR9-mediated immune response, but have thus far been unpromising in treating gliomas. Furthermore, high doses of CpGs have a toxic effect and may exacerbate brain swelling in glioma patients. This technology provides a novel means of conjugating CpGs to carbon nanotubes (CNT) as a delivery mechanism across the blood-brain barrier. Mouse studies show that CpG-CNTs delivered through a burr hole to the brain effectively eradicated intracranial gliomas by activating NK and CD8 immune cells. CpG dosage could be significantly decreased due to more efficient uptake, minimizing risk of negative side-effects. Additionally, and of great import given that glioma reoccurrence is common in humans, long-term immunity was observed in CpG-CNT treated mice when cancer was reintroduced.

KEY ASPECTS

- Utilizes single walled carbon nanotubes – efficient, metabolizable macromolecule carriers
- Additional animal data available upon request
- Mice treated with this technology developed immunity against tumors when rechallenged

PUBLISHED DATA

- [Zhao D. et al. Clin Cancer Res. 2011 Feb 15; 17\(4\):771-82.](#)

INTELLECTUAL PROPERTY

Title	US Patent Application	Filed
CpG delivery with carbon nanotubes treating gliomas	61/557,843	11/9/2011

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