Editorial

Nanoparticles for treating brain tumors: unlimited possibilities

The use of nanoparticles to improve the distribution and extend the duration of exposure to therapy continues to be investigated and applied in cancer research and treatment, respectively, more than 30 years subsequent to the earliest publications involving its use in experimental tumor models in vivo. Nanoparticle packaging of therapy is of particular interest for its potential to treat brain tumors because of the favorable CNS distribution of many nanoparticle drug formulations.

Although most often used for delivering chemotherapy, nanoparticles can also be used as carriers for numerous anti-cancer agents, including radionuclides, as indicated in the article from Brenner et al. [1] in the current issue of Neuro-Oncology. Specifically, the authors show that 186-Rhenium liposomes can be administered directly to orthotopic GBM xenografts, allowing one to achieve a much higher radiation dose in the tumor bed (>1800 Gy) than could be reasonably achieved through the use of external-beam radiation. Amazingly, many of the animal subjects in this study, treated 21 days after tumor cell injection, appeared to be cured of tumor, as indicated by a lack of detectable luminescence signal from luciferase-modified tumor cells, lack of detectable contrast-enhancing tumor, and lack of evident tumor cells on histopathologic analysis of resected animal brains. Moreover, there was little indication of radiation necrosis effects on normal brain tissue, suggesting that toxicity from this therapy is modest.

As is the case for nearly all animal model preclinical efficacy studies, estimated tumor burden at time of treatment, relative to that in a patient with residual tumor after surgery, was minor, making it difficult to extrapolate the success of the animal model experiments to a clinical setting. It will be of great interest to determine whether sufficient 186-Rhenium liposomes can be applied to the resection cavities of GBM patients, either intra-operatively or post-operatively, to confer a survival benefit. Nonetheless, the results presented here are impressive and provide a reason for optimism regarding this treatment approach for patients with GBM. The possibility of combining local administration of high-dose radionuclide nanoparticles with systemic administration of cytotoxic chemotherapy, such as temozolomide, is exciting, and it seems to be a likely direction for additional pre-clinical research in the near future.

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