Implantable Microdevice for Drug Efficacy Testing in Tumors

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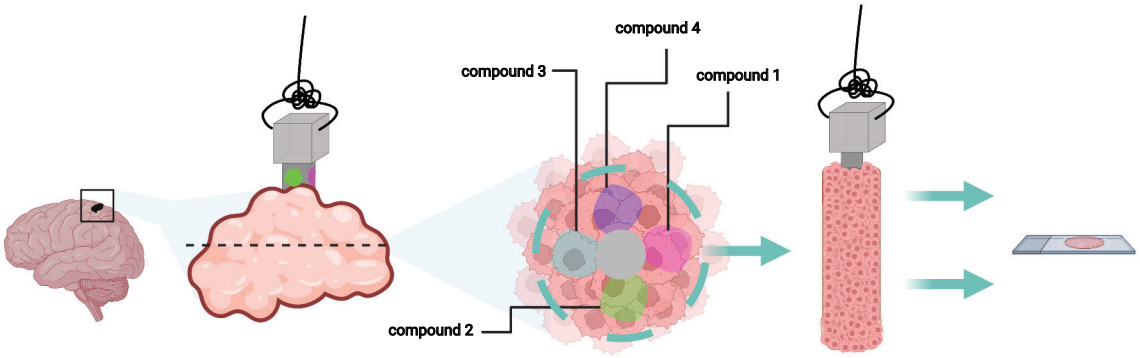
Implantable microdevices (IMDs) have emerged as a useful method to improve the processes of cancer treatment. Existing tumor imaging, tumor marking analysis, and other current alternative cancer drug assessment and treatment methods expose patients to drug toxicities, require months to years for results, and may not accurately model in vivo tumor sensitivities. Utilizing IMDs for assessment of brain and deep-tissue tumors requires modifications to the size and shape of existing IMD designs. Using clinician input, the brain IMD was redesigned for placement under the meninges and is removed with surrounding tissue through a biopsy procedure. Additional adjustments were made for removal by pulling on a nylon suture in the case of an aborted procedure. Force testing was performed to determine if the suture interface would be able to withstand estimated removal forces. The brain IMD was able to withstand a force over 120% greater than the force required as estimated by the clinician. The brain IMD was also able to withstand a force over 1200% greater than the force as estimated by phantom model testing. The deep-tissue IMD shaft design was significantly modified in order to facilitate minimally invasive retrieval through a 16-gauge needle. In order to evaluate drug effectiveness, a 400 μm radius of tissue is needed. The deep-tissue IMD design was tested in phantom gels and tissue samples in order to determine the amount of tissue collected during the biopsy. We plan to further investigate the efficacy of the brain and deep-tissue IMDs by conducting animal trials to evaluate their drug eluting properties.



Delivery
Device is inserted into the brain lesion site

Dosing
Device releases drug microdoses into tumor

Retrieval
Frozen tumor sections are prepared for histology

Histological Analysis
Determines drug effectiveness for comparisson