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OPTIMIZATION AND DRUG RELEASE KINETICS OF A BIORESORBABLE NERVE CONDUIT

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Peripheral nerve trauma due to accidents can cause lacerations to the peripheral nerves. When this occurs, subsequent nerve growth is usually impaired and can lead to the loss of sensation and paralysis of areas associated with the injured nerve(s). The current gold standard for treatment is the usage of autografts, but this can lead to donor site morbidity and is also inconsistent in treatment effectiveness. A suitable alternative treatment method is an implantable nerve guidance conduit (NGC) that directs the connection of the proximal and distal ends of the lacerated nerve during nerve growth. Varying the design of the NGC allows the facilitation of drug delivery via diffusion through a hole between the conduit and an attached reservoir that can release nerve growth factors to the injury site. The growth factor FK506, or tacrolimus, is a small molecule clinically used as an FDA-approved immunosuppressant. Additionally, FK506 can facilitate wound healing and exhibits neurotrophic effects that improve motor neuron recovery.

The design aim of this project is to perform preliminary testing in evaluating the drug release kinetics of a bioresorbable reservoir-based NGC by conducting release tests. A total of 14 poly-L lactic acid (PLLA) NGCs were manufactured for release tests, which were comprised of a fluorescein dextran test followed by an FK506 test. The data were compared to a diffusion model based on the NGC device parameters. Overall, the results indicate potential for controlled and consistent release of neurotrophin from the reservoir-based PLLA NGCs.

References:

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