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Methylcellulose/Agarose Hydrogel System to Release Therapeutic Agents

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Our laboratory has previously developed an injectable hydrogel blend consisting of agarose and methylcellulose that solidifies at physiological temperatures. This study examined the feasibility of loading a chemical species into the hydrogel blend for controlled release. Free radical formation and excessive inflammation following initial central nervous system (CNS) trauma contribute to secondary injury. Therefore, the anti-oxidant glutathione and the anti-inflammatory cytokine interleukin-10 (IL-10) were loaded into the hydrogel blend for the purposes of neutralizing free radicals generated and inhibiting excessive inflammation following CNS injury, respectively. Using Ellman's reagent, glutathione release from the hydrogel was monitored, and data from these experiments reveal that the agarose-methylcellulose hydrogel blend delivers glutathione for up to five days *in vitro*. Similar experiments were performed on IL-10 release, which was released for up to four days. Recent experiments have focused on implementing the glutathione-containing hydrogel in a neuronal culture model that contains elevated levels of free radical. In addition, other experiments have focused on implementing the IL-10-containing hydrogel in a monocyte culture model and observing the effects of tissue necrosis factor alpha (TNF-α) production. Based on these preliminary findings, hydrogel blends consisting of agarose and methylcellulose loaded with glutathione and/or IL-10 could potentially spare uninjured neurons from secondary injury. Future experiments will utilize a rat spinal cord injury model to further evaluate the efficacy of the hydrogel system. In addition to its use as an injury intervention, the hydrogel system also has the potential for use as a coating in implantable devices, especially in the CNS.

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