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[180]

DESIGN OF DNA-CROSSLINKED HYDROGELS FOR NEURAL CELL STUDY

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The objective of the current study is to control and alter the stiffness of DNA-crosslinked hydrogel in tissue engineering applications such as directed axonal regeneration. Our group and other investigators have demonstrated that rat spinal cord neurons grew on bis-crosslinked polyacrylamide (PAA) gels and exhibited typical neuronal morphology. As a next step, two tasks were performed, design of DNA-crosslinked gels and neural cell study on these gels.

To provide controlled mechanical cues to promote and guide neuronal growth, the mechanical properties of DNA gels have been characterized. Altering crosslink parameters such as crosslink lengths, density and monomer concentration, mechanical properties can be modulated. Wide ranges of material stiffnesses are available for mechanical compatibility in tissue substrate and/or scaffold. Currently we have successfully altered the mechanical properties from very soft (1~2kPa) to over 70kPa. Study of another parameter, viscosity of the hydrogel revealed consistent gelation between 25 to 30% of crosslinking. These results provide necessary information to probe cell behavior on DNA crosslinked hydrogels.

Using a specific design of DNA-crosslinked hydrogels, neural cells in embryonic rat spinal cord dissociation were found to also grow on these gels that were prepared, functionalized with bi-functional reagents and conjugated with extracellular matrix protein including collagen for cellular attachment.

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