REVERSIBLE HYDROGELS BASED ON POLY(STYRENE-*CO*-MALEIC ANHYDRIDE)

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ABSTRACT

The advancement of contraceptive research and development has become a focal point in recent years owing to the surge in human population.[1] Due to the vast number of current contraceptive options available to females, researchers are placing more emphasis in developing contraceptive techniques which cater for males.[2] Current attempts to develop new male contraceptives include both hormonal and non-hormonal approaches.[1] Among the more favourable non-hormonal approaches is "reversible inhibition of sperm under guidance" (RISUG), which utilises an SMA-based co-polymer dissolved in dimethyl sulphoxide (DMSO) to form a hydrogel.[3] Although promising, the RISUG approach has limitations associated with its reversal, as removal from the vas deferens would require either an external mechanical stimulus or introduction of a DMSO/ sodium bicarbonate ($NaHCO_3$) solution.[4] Both of these reversal approaches have the potential to cause damage to the surrounding vas deferens tissues due to the high molecular weights (60 000- 100 000 g/mol) and associated viscosities of SMA polymer used.[5]

A previous study carried out by our group showed that chemical crosslinking between functional SMA and poly(vinyl alcohol) (PVA) resulted in successful hydrogel formation; gel dissociation occurred when immersing gels in a glucose solution (1000 mg/dL) at pH= 9.[6] The focus of this study was to optimize the reversal of hydrogels based on functional SMA and PVA for possible end-application in an injectable male contraceptive. This was done by considering parameters regarding SMA molar mass, percentage maleic anhydride monomer, degree of crosslinking by modification with 3-aminophenyl boronic acid, concentrations of SMA and PVA, and the ratio of SMA to PVA. Furthermore, an investigation into the possibility of shear thinning and recovery of the hydrogels was carried out as this was considered a fundamental characteristic to the "injectable" nature of the gel.

References:

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