n matrices: release of a random coil macromolecular solute.

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Abstract:

The purpose of this investigation was to evaluate the effect of matrix crosslinking and solute size on release of a random coil macromolecular solute from crosslinked gelatin matrices. Gelatin hydrogel matrices crosslinked with different molar ratios of 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide (EDC):epsilon-amino groups on gelatin (1:1, 4:1, and 10:1) were prepared containing dextran of molecular weights 12, 20, and 77 kDa, and hydrodynamic diameters 54, 74, and 133 A, respectively. The extent of matrix crosslinking was determined quantitatively and used to calculate the molecular weight between crosslinks (Mc). The Mc parameter and equilibrium swelling ratio (Qm) were used to calculate an estimated matrix mesh size (xi). The in vitro release of incorporated dextran was evaluated at 37 degrees C in PBS at pH 7.4 for approximately 80 h. The one-, four- and 10-fold molar ratios of crosslinking agent EDC yielded 24, 41, and 78% of gelatin matrix crosslinking, respectively. The calculated average matrix mesh size ranged from 338 to 90 A. The effect of matrix crosslinking varied with solute size, from retarding diffusional release of the dextran to completely entrapping it inside the crosslinked matrices. These results support the threshold concept of solute size relative to matrix mesh size for release of a flexible, random coil macromolecular solute from a hydrogel.