Degradable Dendrimers, Hydrogels, and Gene Delivery Vehicles Made From 1,3,5-Triazaadamantanes

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1,3,5-Triazaadamantanes (TAA) are a class of compounds formed from the condensation of three equivalents of an aldehyde with analogues of 1,1,1-tris(aminoethyl)ethane. This unit displays tunable hydrolytic degradation that depends on the electronic properties of the aromatic aldehyde. Degradation occurs relatively rapidly under acidic conditions and produces basic byproducts.

Utilizing the branched architecture of these molecules, degradable monomers and crosslinkers were synthesized. These monomers were used for the iterative, divergent synthesis of large, degradable dendrimers that may act as drug delivery vehicles. TAA crosslinkers were reacted with polyethyleneimine or polymerized with acrylamides to create degradable gene delivery vehicles and hydrogels. Potential applications of these hydrogels are in the areas of drug delivery, cell therapy, and tissue engineering.