Supporting Information Figure Legends

Supporting Figure 1. Starting solutions of pre-treated D187N gelsolin173-243 peptides were analyzed by atomic force microscopy (AFM) and analytical ultracentrifugation (AUC) to confirm the presence of ~93% monomeric peptides.

Supporting Figure 2. (A, B, C) Reactions were performed with WT gelsolin173-243 (10 μM) (A) in 100 mM NaCl, 50 mM HEPES (pH 7) buffer with 20 μM thioflavin T added at 37 °C shaking every 10 mins for 5 seconds per reading. Data shown is an average of triplicate samples, corrected for background fluorescence. GAGs (5 μM) indicated were added at the initiation of aggregation. **(D)** Reactions were performed with D187Y gelsolin173-243 (10 μM) in 100 mM NaCl, 50 mM HEPES (pH 7) or sodium acetate (pH 5) buffer with 20 μM thioflavin T added at 37 °C shaking every 10 mins for 5 seconds per reading as described above.

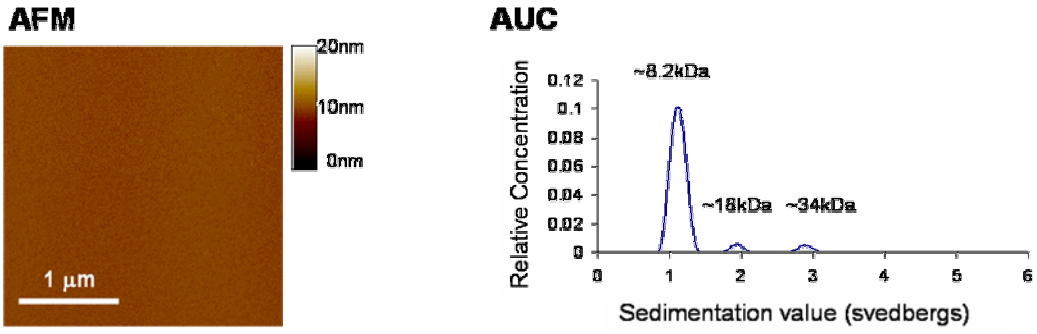
Supporting Figure 3. Reactions were performed with D187N gelsolin173-243 (5 μM) in 100 mM NaCl, 50 mM HEPES (pH 7) buffer with 20 μM thioflavin T added at 37 °C shaking every 10 mins for 5 seconds per reading. Data shown is an average of triplicate samples, corrected for background fluorescence. Heparin, dextran sulfate, dextran, poly-glutamic acid (poly E) or poly-L-lysine (poly K) (5 μM) were added at the initiation of aggregation.

Supporting Figure 4. Original TEM images taken. **(A)** D187N gelsolin173-243 aggregated in the presence of dp4 heparin oligo and **(B)** with 17-19 kDa heparin.

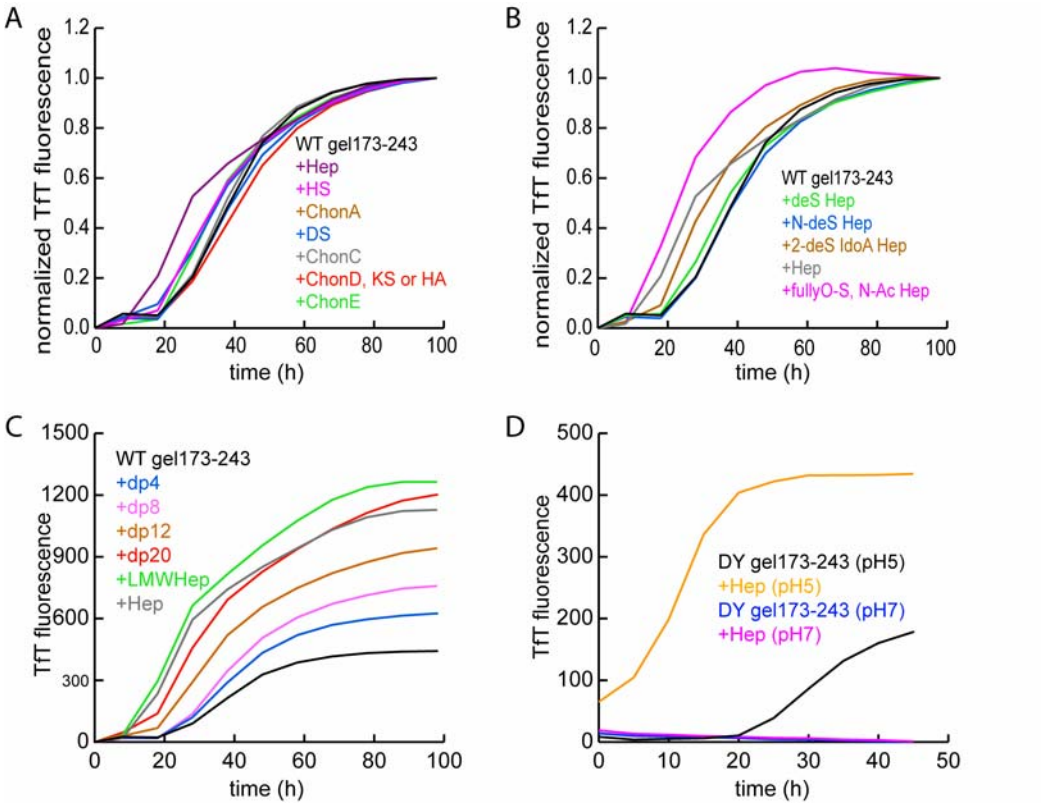
Supporting Figure 5. Original TEM images taken. D187N gelsolin173-243 aggregated alone at 43 h **(A)** and at 90 h **(B)**. **(C)** D187N gelsolin173-243 aggregated with heparin from the start; image taken at 43 h. **(D)** Aggregated sample at 90 h after heparin is introduced at 43 h.

Supporting Figure 6. Light scattering data points overlaid with analytical size exclusion chromatography UV absorption traces (280 nm) of D187N gelsolin 173-243 aggregation samples at 12 h **(A)**, with HS **(B)** and with heparin **(C)**. The monomer peak and the soluble aggregate peak (molar mass derived from light-scattering) are depicted.

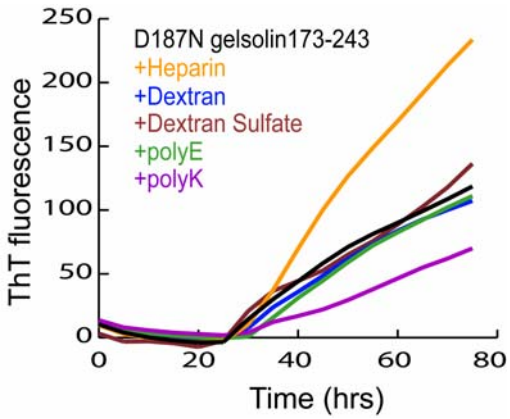
Supporting Figure 1.



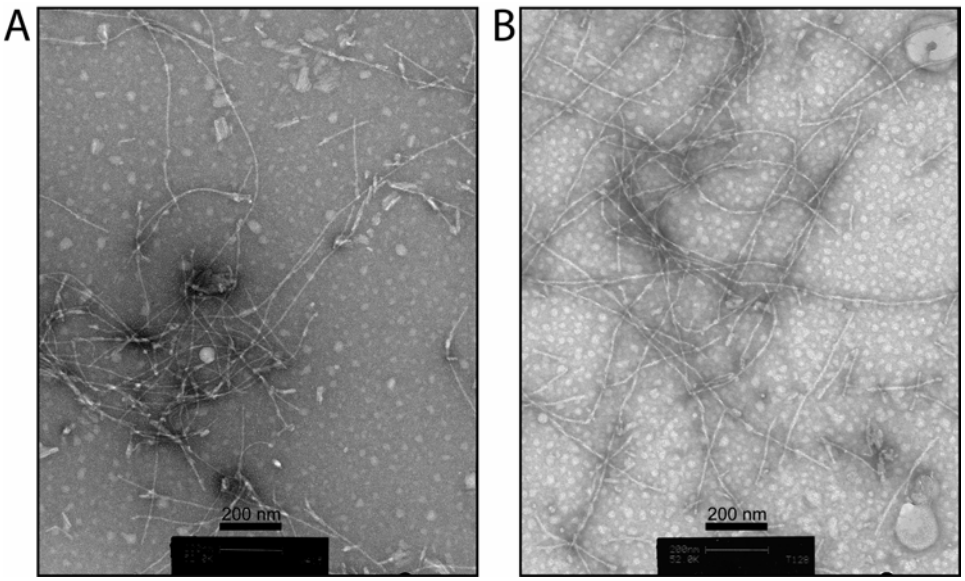
Supporting Figure 2.



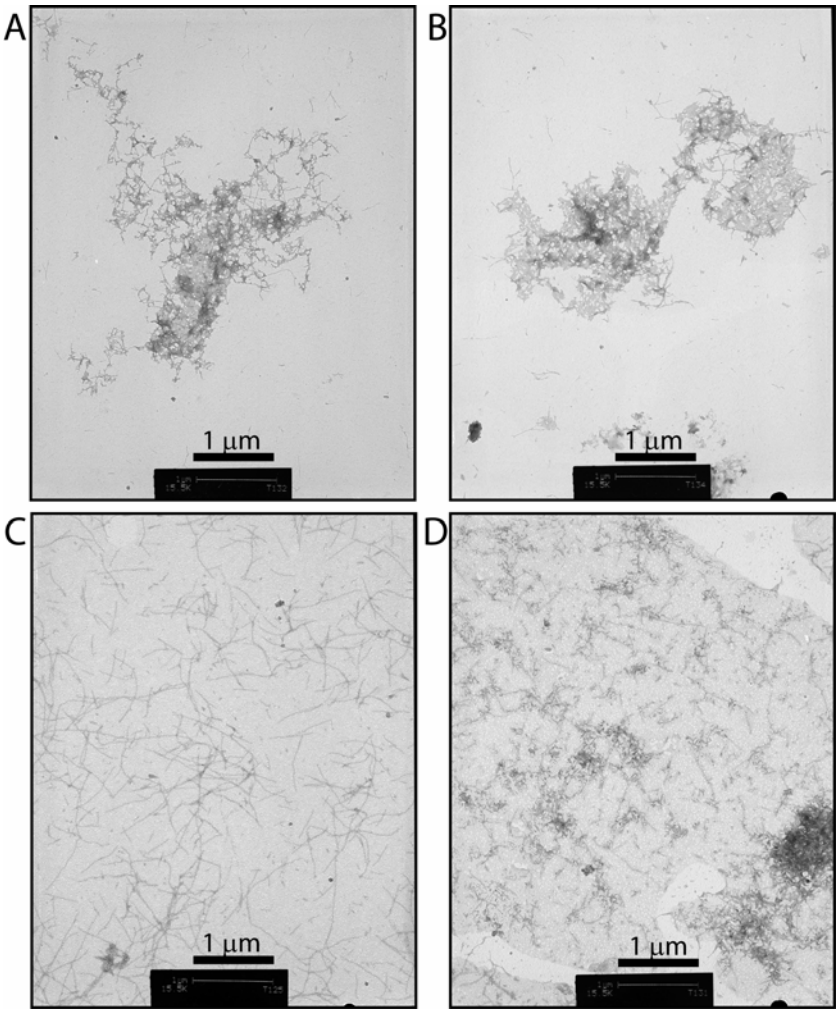
Supporting Figure 3.



Supporting Figure 4.



Supporting Figure 5.



Supporting Figure 6.