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Electrospun Synthetic Polypeptide Nanofibrous Biomaterials

DHAN KHADKA, DONALD HAYNIE, University of South Florida — Water-insoluble nanofiber mats of synthetic polypeptides of defined composition have been prepared from fibers electrospun from aqueous solution in the absence of organic co-solvents. 20-50 kDa poly(L-glutamate, L-tyrosine) 4:1 (PLGY) but not 15-50 kDa or 50-100 kDa poly(L-glutamate) was spinnable at 20-55% (w/v) polymer in water. Applied voltage and needle-collector distance were crucial for spinnability. Attractive fibers were obtained at 50% polymer. Fiber diameter and mat morphology have been characterized by electron microscopy. Exposure of spun fiber mats to 1-ethyl-3-(3-dimethylaminopropyl) carbodiimide hydrochloride (EDC), which reacts with carboxylate, decreased fiber solubility. Fluorescein-conjugated poly(L-lysine) (FITC-PLL) but not the fluorophore alone was able bind PLGY fiber mats electrostatically, judging by fluorescence microscopy. Key advances of this work are the avoidance of an animal source of peptides and of an inorganic co-solvent to achieve polypeptide spinnability. Polypeptide fiber mats are a promising type of nano-structured biomaterial for applications in biomedicine and biotechnology.

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