Biodegradable and Biocompatible Silk Fibroin Film with Reduced β-sheet Structure

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Silk fibers from spider and silkworms have attracted a great deal of recent interest due to their impressive mechanical properties and their formation of liquid crystalline phases during processing and assembly *in vivo* and *in vitro*. Silkworm silks in the natural fiber form have a longstanding use in biomedical applications such as sutures, have comparable mechanical properties to spider silk, are available in large supply, and are currently being explored as regenerated materials to form films, fibers and scaffolds. In the present study, more elastic but still water insoluble silk-protein films were desired to extend material properties by alternative processing of silk protein. To achieve this objective, water-stable cast films from regenerated fibroin were considered, but with reduced content of β-sheet that is normally induced by exposure to methanol or by physical shear. These new materials degrade more rapidly due to the reduced β-sheet content as determined in vitro via enzymatic hydrolysis, yet support human adult stem cell expansion in vitro in a similar or improved fashion to the crystallized proteins in film form.