Expression Systems for Synthetic Spider Silk Protein Production | Biological Engineering

04/19/2019

Abstract: Spider silk is a biodegradable and biocompatible natural material that is stronger than steel and more elastic than nylon. These properties make spider silk a desirable material for many commercial products, ranging from textiles to biomedical materials. Due to spiders’ cannibalistic and territorial nature it is impossible to farm them to produce spider silk at a high enough yield to meet product demands. Therefore, a bioengineered synthetic process is necessary to produce spider silk. Synthetic spider silk has been produced in bacteria, goats, yeast, plants, mammalian cells and silkworms, but none of these processes provided a commercially viable yield or were able to express recombinant spider silk proteins (rSSps) that can mechanically imitate the natural spider silks. The overall goal of this research was to increase the yield and mechanical characteristics, e.g. strength and elasticity, to create a commercially viable spider silk. Three different hosts were used: E. coli, alfalfa and an insect cell line. Each host addresses issues with synthetic protein production in both the short-term and long-term scheme. Through this research yields were increased, while the mechanical properties of the synthetic silks were improved and groundwork for future research into the improvement of synthetic spider silk production were identified.

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