

Functionalization of spider silk with growth factors and its applicability for in vitro cell culture

Master degree project available at KTH Biotechnology in autumn 2017

Background

Spider silk is a natural polymer that has an exquisite way of combining strength and elasticity. It has also been attributed to stop bleedings and promote wound healing. We work with a miniature spider silk protein, 4RepCT, which can be produced in *Escherichia coli* and still maintain the ability to spontaneously form silk-like fibers. In addition, 4RepCT can also be formulated into other formats such as coating of cell culture wells and 3D formats that have been shown favorable as matrices for mammalian cell culture (Figure 1). As 4RepCT is produced recombinantly, it is possible to functionalize it with various cell binding motifs and bioactive domains that promote proliferation of mammalian cells.

Aims

The aim of this project is to compare the functionality of different variants of growth factors conjugated to spider silk by performing receptor binding studies and 2D cell culture. Thereafter, selected growth factor-silk variants (silk-GF) will be used for 3D culture (fiber or foam) of mammalian cells.

Methods

The project will cover investigation of function at biochemical level e.g: receptor binding analysis with surface plasmon resonance (SPR) and/or with Octet. Moreover, basic cell culture methods will be used to investigate viability and proliferation of mammalian cells in 2D and 3D cell culture. Finally, various cell stainings will be used for evaluation of adherence and morphology.

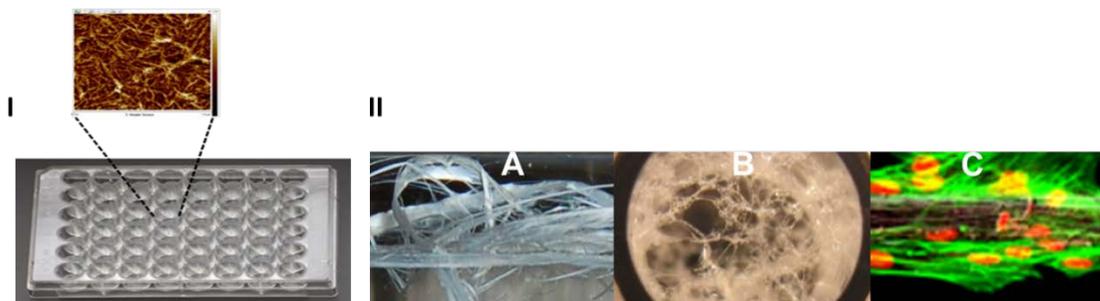


Figure 1. Recombinant spider silk for development of cell matrices

I: Cell culture well coated with silk-GF fusion protein. Upper panel, AFM image depicting the retained fibrillar network of 4RepCT even after conjugated to a growth factor.

II: A) 3D Fiber in water. B) 3D Foam in cell culture plate. C) Human primary fibroblasts grown along a fiber.

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