Diploma work:

Functionalisation of Recombinant Spider Silk

Background:

Native spider silk shows fascinating mechanical properties, with high tensile strength and elasticity compared to other polymers in nature. These extreme properties, combined with its biocompatibility, make spider silk a highly interesting biomaterial for various medical and biotechnological applications.

Native spider silk is mainly composed of spidroins, *i.e.* long proteins with non-repetitive N- and C-terminal domains and a highly repetitive region in-between. The repetitive region consists of approximately 100 recurrent poly-alanine blocks interrupted by glycine-rich stretches. Major efforts have been directed to producing recombinant spider silks, but several factors, including the long, repetitive and aggregation-prone sequence of silk proteins, complicate the recombinant production of soluble protein and controlled polymerisation. Our group has recently managed to clone and express a recombinant spider silk protein, containing four poly-alanine/glycine-rich regions and the non-repetitive C-terminal domain (4RepCT), which self-assembles into macroscopic fibres under physiological-like conditions.

In recent years, considerable efforts have been devoted to further enhance the functionality of natural spider silk, thereby inducing properties such as fluorescence, vapour sensing ability, magnetism or electrical conductivity. In a similar fashion, it may be desirable to equip the industrially more relevant recombinant silk fibres with additional qualities in order to facilitate advanced biomedical applications.

Aims:

The first goal of the project is to clone, express and purify two novel recombinant spider silk fusion proteins. Moreover, functionality studies of the two fusion proteins, both in fibre and film formats, will be performed.

Methods:

In order to proceed from gene to protein fibre several important biotechnology methods will be utilised, *e.g.* PCR, molecular cloning, recombinant protein expression and purification, together with fibre formation.

Supervisors:

Ronnie Jansson, PhD student, ronnie.jansson@slu.se
My Hedhammar, Associate Professor

Location:

Department of Anatomy, Physiology and Biochemistry,
Swedish University of Agricultural Sciences (SLU),
Uppsala Biomedical Centre (BMC), B9:4

Duration: 20 weeks

Period: Autumn 2011

Application deadline: 2011-06-30 (to **ronnie.jansson@slu.se**)

Photograph of a wet 4RepCT fibre.