Name: Lara Bitar

Name of the project: Fibroin from tobacco cells for medical use

Abstract of the project:

Fibroin is the basic component of Silkworms silk, a natural and biodegradable material with exceptional mechanical properties such as elasticity, strength, durability and biocompatibility. It is a base polymer material used by industries for the production of biomedical products.

The process used for recovering and regenerating fibroin from the silkworm *Bombyx mori* silk alters the proteins intrinsic physical and mechanical properties; it is an animal-based process that results in impurities in the final product, with the absence of a standard characterization protocol for proteins.

Our aim is to establish an efficient and sustainable Plant based production platform for Fibroin, grown in bioreactors, for soluble fibroin monomers, that we can later polymerize and process in different ways depending on the application.

Our plan is primarily to produce Fibroin in tobacco cells using molecular engineering techniques and Plant molecular farming. Secondly, to optimize the plant cells metabolism towards the high-level production of these large repetitive proteins, to explore different fusions and expression strategies to increase fibroin solubility, accumulation and recovery. Then to compare the recombinant Fibroin with the natural Fibroin and establish standard characterization protocols of these proteins, to finally test the mechanical, physical and biological properties of the recombinant proteins and evaluate how to implement these raw materials into the established manufacturing routines of the Industry.

The expected results are the production of recombinant Fibroin that preserved its natural characteristics, from plant cells using an animal free technique. The optimization of Plant based production protocols and the establishment of a standard characterization protocol.

Introduction of the ESR: I am 24 years old from Lebanon. I obtained my master's degree in research in Molecular Biology and Applied Biotechnology from the Lebanese University where I worked on the Extraction and Characterization of the PLA2 enzyme from bee venom and tested its therapeutic effect on colon cancer cells. I am also the first author of a published review entitled "Bee venom PLA2 versus snake Venom PLA2: evaluation of structural and functional properties". I am motivated to use my knowledge and skills to take part to in the advancement of scientific research especially if it contributes to more sustainable and circular production that will benefit our environment.

Keywords: Fibroin, silk, silkworm, Tobacco cells, Plant Molecular Farming, Molecular biology, Biotechnology.

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