

# The Amazing Potential of Silk Proteins for Cancer Management <sup>†</sup>

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<sup>†</sup> Presented at 1st OncoHub Conference – Connecting Scientists for Next Generation Cancer Management (13-15 October 2021, virtual)

Received: 25.10.2021; Accepted: 5.02.2022; Published: 14.02.2022

**Abstract:** Silks are obtained by several organisms such as spiders, silkworms, scorpions, mussels, bees, and ants. They are amazing protein materials with exceptional properties for biomedical applications. Silk fibers as sutures have been used for centuries, and more recently, regenerated silk solutions have been used to form different biomaterials, such as micro-and nanoparticles, hydrogels, films, sponges for medical applications. Both silk fibroin and sericin could be used to deliver various chemotherapeutic drugs in cancer management. In this respect, we report here the preparation and complex characterization of various types of silk fibroin nanoparticles loaded with 5-FU for colorectal cancer therapy. We investigated the fibroin nanoparticles in terms of size and morphology and in terms of in vitro antitumoral activity on a biomimetic colorectal cancer model. Secondly, we show the potential use of silk sericin nanoparticles with a very low size range obtained by the nanoprecipitation technique. Sericin nanoparticles were loaded with doxorubicin, and they were considered a promising tool for breast cancer therapy. The biological investigation on breast cancer cell lines showed a high activity of sericin particles in cancer cells by inducing DNA damage. More recently, we focused on developing non-viral vectors based on polymeric nanoparticles for brain cancer gene therapy. This aims to address the molecular level of gene delivery as a prospective remedial route for brain cancer. This novel approach offers new insights into gene mutation-specific for cancer expression by gene delivery via non-viral vectors based on functionalized proteins.

**Keywords:** fibroin; sericin; nanoparticle; nanoprecipitation; cancer management.

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## Funding

This work was supported by a grant from the Ministry of Research, Innovation and Digitization, CNCS/CCCDI – UEFISCDI, project number PN-III-P4-ID-PCE-2020-1448, within PNCDI III.

## Acknowledgments

This research has no acknowledgment.

## Conflicts of Interest

The authors declare no conflict of interest.