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Potential of Thai silk fibroin-based hydrogel in bone regeneration

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Thai Silk Fibroin (SF), a natural beta-sheet structure protein, were extracted using a sterile condition using local silkworm strain in Thailand. Physico-chemical properties of the solution were welled studied from the previous works. SF protein is biocompatible and has exceptional mechanical properties and delayed biodegradability compared to other proteins. Gelation of the SF solution can be induced physically or chemically in a controllable manner. Example of a potential application of the Thai SF hydrogel demonstrated from the in vitro biocompatibility and osteogenic potential of encapsulated rat bone marrow-derived Mesenchymal Stem Cells (rat MSCs) will be discussed. The injectable Thai SF/collagen hydrogel was induced using medical surfactants, oleic acid-poloxamer 188 mixture. Three groups of hydrogels 1) 4 %wt silk fibroin(SF), 2) 4 %wt silk fibroin with 0.05% collagen (SF/0.05C), and 3) 4% wt silk fibroin with 0.1% collagen (SF/0.1C), were tested. *In vitro* growth, kinetic kinetics parameters and differentiation were evaluated at 6 weeks of cell culture in the hydrogels. The results showed cellular viability and proliferation in all types of hydrogels. Although SF/0.1C hydrogel exhibited the lowest availability at initial seeding it had the highest cell's specific growth rate. During osteogenic stimulation, cellular proliferation and differentiation in Thai silk fibroin hydrogel were evaluated. The results confirmed the positive effect of collagen combined in the hydrogel on proliferation and matrix formation, however, benefits on osteogenic differentiation and biomineralization were uncleared. Some early results in animals will be presented.

Biography

Sorada Kanokpanont received a PhD, in Chemical Engineering (specialized in Biochemical Engineering) from Drexel University, USA. She is currently a faculty member at the Department of Chemical Engineering, Faculty of Engineering, Chulalongkorn University. She is also a chair of Nano-bioengineering program at the International School of Engineering and a board committee of the Thai Biomedical Engineering Research Society, Thailand. She has more than 15 year-experiences in Biomaterial research and application in Tissue engineering and drug delivery systems. She received numerous research awards in Thailand and two silver medals in Geneva Invention awards in Tissue engineering products. She granted a membership of Newton fund – Leader in Innovation Fellows, The Royal Academy of Engineering, UK, a scholarship from the MIT enterprise forum, and a start-up TED funding for an innovative product from 2017-2018. Her international grants from 2008 – 2020 were the Thailand-Japan technology transfer project (TJTTP), the EU sponsored Erasmus Mundus, Erasmus Plus, and the Marie Skłodowska-Curie Actions, Research and Innovation Staff Exchanges 2017. She published more than 55 international research articles in biomaterials and held 9 Thailand's patents (some are pending).

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