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Enhancing the Anti-inflammatory and Antiarthritic Activity of Astaxanthin using Chitosan Oligosaccharide/Alginate Nanoparticles

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Inflammation is the physiological defense mechanism against many stimuli, and protein denaturation is the cause of the onset of inflammation and arthritic disease. Non-steroidal anti-inflammatory drugs (NSAIDs) are extensively used to treat rheumatoid arthritis and pain, but several side effects such as gastric irritation, liver damage, and dyspepsia, were reported. To avoid the side effects and toxicity of NSAIDs, bioactive compounds extracted from various plants have been used in the clinical

treatment of inflammation and arthritic disease for many years. Among the various bioactive compounds, astaxanthin (ATX) is a natural xanthophyll carotenoid with significant antioxidant, anti-inflammatory, and antiarthritic properties. However, its use in pre-clinical or clinical is currently limited by its low solubility and bioavailability. Thus, an encapsulation of ATX in an effective polymeric-based nanocarrier is a promising approach for overcoming the limitations of ATX. Our previous studies suggested that the water solubility, physicochemical stability, in vitro bioaccessibility and bioavailability, antioxidant, and anticancer activity of ATX was significantly enhanced by encapsulation within chitosan oligosaccharide/alginate nanoparticles (ATX-COANPs) prepared under the optimum condition. However, its potential role in the inflammatory and arthritic of ATX-COANPs is still not reported elsewhere. To assess the potential anti-inflammatory and antiarthritic activities, in the present study, the ATX-COANPs were determined for red blood cell (RBC) membrane stabilization assay for anti-inflammatory responses and the protein denaturation method for antiarthritic assay.

The ATX-COANPs showed stronger RBC membrane stabilizing activity and protein denaturation inhibition activity than free ATX in a concentration-dependent manner. In conclusion, the ATX-COANPs showed significant in vitro anti-inflammatory along with the inhibition of denatured protein, suggesting the potentially used as an alternative therapeutic agent for the treatment of arthritis.

Biography

Dr. Feuangthit N. Sorasitthiyanukarn is a senior research specialist at Chulalongkorn University's Metallurgy and Materials Science Research Institute and the Center of Excellence in Natural Products for Ageing and Chronic Diseases. His area of interest includes nanotechnology, drug delivery, nanomaterials, and the encapsulation of bioactive compounds using chitosan and alginate-based nanoparticles. He has published a number of research articles about the application of chitosan and alginatebased nanoparticles as carriers of bioactive compounds for cancer treatment in reputed journals. He was particularly interested in topics such as the use of experiment design and response surface methodology in pharmaceutical formulation development. He serves as an assistant supervisor for master's and PhD degree candidates who are making dissertations on the drug delivery system.

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