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Enhanced Topical Administration of Astaxanthin from Activated Nanogel

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Abstract (not more than 300 words)

The aim of the present investigation was to enhanced topical administration of astaxanthin from activated nanogel. The solubility study of drug in different surfactant solution was carried out by optimizing the different surfactant concentration at which maximum drug gets solubilized. Drug-excipients incompatibility study was carried out using Fourier Transforms Infrared spectroscopy (FTIR). A nanogel based on co-polymerized N-isopropylacrylamide (NIPAM) and butylacrylate (BA) was synthesized, characterized and loaded with astaxanthin by using emulsion polymerization method. Activated nanogel were evaluated for organoleptic characteristic, morphological characteristics, gelling property, particle size, zeta potential, percent drug entrapment, swelling ratio, viscosity, thermal analysis (differential scanning calorimetry), transmission electron microscopy (TEM), *in vitro drug* permeation on rat skin using franz diffusion cell, skin irritation on rat skin and stability. Fourier Transform Infrared Spectroscopy (FTIR) study shows that neither drug decomposition nor drug-excipients and excipient-excipient interactions occurred in the formulation. Solubility of drug was found to be maximum in 1.5 % w/v concentration of sodium lauryl sulphate solution. Activated nanogel shows good organoleptic properties. Transmission electron microscopy confirms the nanogel particles were monodisperse by having uniform size and spherical shape. The image also serves to validate the purification step, by the absence of extraneous particulates. Particle size, zeta potential, percent drug entrapment, gelling capacity, viscosity and swelling ratio was found to be 464.90±2.02 nm, -31.7±2.66 mV, 97.19±0.02 %, good, 16,000±707 cps and 13.88±0.16 respectively. Differential scanning calorimetry indicated that the lower critical solution temperature for poly (N-isopropylacrylamide-co-Butylacrylate) in deionized water was found to be 31.1˚C and it produced temperature sensitive property.
In vitro permeation of optimized batch on rat epidermal membrane using in franz diffusion cells, followed by the addition of saturated aqueous sodium carbonate demonstrated de swelling over the range 25-37˚C, provided a astaxanthin flux of 1.69±0.03 $\mu gcm^{-2}h^{-1}$ which increased to 0.20±0.0015 $\mu gcm^{-2}h^{-1}$ upon the addition of saturated aqueous sodium carbonate up to 24 hrs. Which suggested the novel mechanism is proposed whereby the change in temperature experienced by the nanogel as it penetrated skin induced de-swelling and expulsion of astaxanthin *in situ*. *In vitro* skin irritation study indicated that no irritation on rat skin. Stability study indicates the developed nanogel was stable at 4-8 ± 2°C /45 ± 5% RH (Refrigerated) condition after 1 month. In the conclusion activated nanogel provide nanosized particle size with good percent drug entrapment, increasing flux through skin and better swelling ratio of polymer could be helpful for the topical administration of astaxanthin with enhanced properly in rheumatoid arthritis condition.

***Keywords*:** Astaxanthin, N-isopropylacrylamide, Butylacrylate, Sodium Lauryl Sulphate, Flux, Franz diffusion cell, Emulsion polymerization.

Professional Biography (100-150 words)

Dr. Deepa Patel is enthusiastic academician and an active researcher in field of Pharmaceutical Technology (GATE qualified). She has completed her Ph.D from The Maharaja Sayajirao University of Baroda, Vadodara. Her research interests primarily focus on developing and translating new drug delivery systems for the prevention and treatment various diseases such as Cancer, HIV and Asthma. She has a special interest in inter-disciplinary research and project with industries and other academic Institutes. She has published 09 research papers in high Impact factor journals. She has filed 05 Indian patent applications in field of Novel Drug Delivery Systems and published 03 International book chapters to her credit. Currently she is working on a funded research project approved by Gujarat Council on Science and Technology (GUJCOST), Gandhinagar. She presented her research paper in 06 international conferences (organized in USA and Canada). She has guided 30 post-graduate students. She has been awarded International conference grant from ICMR and travel grant from Department of Science and technology (DST) and Department of Biotechnology (DBT). She got “Scholar In Training Award” (2000$) from American Association for Cancer Research (AACR), USA for best paper. Currently, she is working as an Associate Professor in Pharmaceutics Department, Faculty of Pharmacy, Parul University. Along with her teaching duties, she serves as an Instrument and Chemical In charge, NBA coordinator and Time Table coordinator duties. She has 7 h-index and 225 citation in scopus and 9 h-index and 380 citation in Google Scholar.



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Any Comments: NO