TOXICITY AND GROWTH BOOST OF ASTAXANTHIN-LOADED SOLID LIPID NANOPARTICLES IN THE CRUSTACEAN *Artemia* sp.

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INTRODUCTION: Astaxanthin (ASTX) is a lipophilic carotenoid widely utilized in aquaculture, the food industry, and biomedicine because of its antioxidant properties and ability to impart coloration to aquatic organisms. ASTX accumulates in aquatic organisms, including crustaceans and fish, and protects them against oxidative stress and adverse environmental conditions. However, the low solubility of ASTX in aqueous media poses a challenge for its incorporation into biotechnological formulations. This carotenoid is highly susceptible to degradation when exposed to light, heat, and oxygen. These limitations compromise its bioavailability and stability, hindering their use in aquatic and biomedical applications. Solid lipid nanoparticles (SLNs) are drug delivery systems composed of a solid lipid matrix stabilized by surfactants. They offer advantages, such as enhanced drug stability, controlled drug release, improved bioavailability of lipophilic drugs, biocompatibility, and biodegradability. **OBJECTIVE**: This study aimed to develop ASTX-loaded SLNs. **MATERIAL AND METHODS**: The SLNs composed of stearic acid and Tween 20 were synthesized and then thoroughly characterized using TEM, DLS, zeta potential measurements, and FTIR Spectroscopy. *In vivo* toxicity and sublethal assays were performed using the crustacean *Artemia* sp. exposed to ASTX-loaded SLNs for 48 h. **RESULTS AND CONCLUSION**: The developed formulation successfully incorporated ASTX (0.47 mg/ml) with an encapsulation efficiency of 87.3%, exceeding its solubility limit (10^{-12} mg/ml). The TEM results confirmed the nanometric size of the particles (45.0 ± 1.4 nm), further analysis revealed their stability in colloidal suspension, and the presence of the intended components within the formulation. The FTIR analysis confirmed the incorporation of astaxanthin in the nanomaterials, showing a characteristic band at 1736 cm^{-1} in the spectrum. The LC50 for the empty SLNs was 34%, whereas the LC50 for the astaxanthin-loaded SLNs was 25% (0.12 mg ASTX/ml), indicating increased toxicity associated with the encapsulated ASTX. Notably, a lower concentration of ASTX-loaded SLNs concentration (0.06 mg ASTX/ml) demonstrated a growth-enhancing effect, resulting in greater length and width of artemia compared to the control. Overall, the results indicated toxicity at concentrations higher than 0.12 mg ASTX/ml, whereas half of this concentration showed suitable to be used as a supplement to boost growth.

Keywords: nanotoxicology, bioactive molecules, crustacean, nanoencapsulation