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Development and Characterization of Novel Topical Formulation Containing Niacinamide

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Abstract : Hyperpigmentation is a cosmetically unappealing skin problem caused by an overabundance of melanin in the skin. Its pathophysiology is caused by melanocytes being exposed to paracrine melanogenic stimuli, which can upregulate melanogenesis-related enzymes (such as tyrosinase) and cause melanosome formation. Tyrosinase is linked to the development of melanosomes biochemically, and it is the main target of hyperpigmentation treatment. therefore, decreasing tyrosinase activity to reduce melanosomes has become the main target of hyperpigmentation treatment. Niacinamide (NA) is a natural chemical found in a variety of plants that is used as a skin-whitening ingredient in cosmetic formulations. NA decreases melanogenesis in the skin by inhibiting melanosome transfer from melanocytes to covering keratinocytes. Furthermore, NA protects the skin from reactive oxygen species and acts as a main barrier with the skin, reducing moisture loss by increasing ceramide and fatty acid synthesis. However, it is very difficult for hydrophilic compounds such as NA to penetrate deep into the skin. Furthermore, because of the nicotinic acid in NA, it is an irritant. As a result, we've concentrated on strategies to increase NA skin permeability while avoiding its irritating impacts. Since nanotechnology can affect drug penetration behavior by controlling the release and increasing the period of permanence on the skin, it can be a useful technique in the development of whitening formulations. Liposomes have become increasingly popular in the cosmetics industry in recent years due to benefits such as their lack of toxicity, high penetration ability in living skin layers, ability to increase skin moisture by forming a thin layer on the skin surface, and suitability for large-scale production. Therefore, liposomes containing NA were developed for this study. Different formulations were prepared by varying the amount of phospholipid and cholesterol and examined in terms of particle sizes, polydispersity index (PDI) and pH values. The pH values of the produced formulations were determined to be suitable with the pH value of the skin. Particle sizes were determined to be smaller than 250 nm and the particles were found to be of homogeneous size in the formulation (pdi<0.30). Despite the important advantages of liposomal systems, they have low viscosity and stability for topical use. For these reasons, in this study, liposomal cream formulations have been prepared for easy topical application of liposomal systems. As a result, liposomal cream formulations containing NA have been successfully prepared and characterized. Following the in-vitro release and ex-vivo diffusion studies to be conducted in the continuation of the study, it is planned to test the formulation that gives the most appropriate result on the volunteers after obtaining the approval of the ethics committee.

Keywords : delivery systems, hyperpigmentation, liposome, niacinamide
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