Coumestrol-loaded nanoemulsions: skin retention and antioxidant studies

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Introduction: Coumestrol is an isoflavonoid found in many leguminous plants, such as in alfalfa and soybeans. Due the ability to donate electrons from hydroxyl groups, coumestrol presents an interesting antioxidant activity, being a promising strategy in preventing skin aging. The aim of this study was to evaluate the permeation profile and antioxidant activity of coumestrol-loaded nanoemulsions, previously reported by Argenta and co-workers (Pharmazie 66: 929–932, 2011).

Methods: Nanoemulsions composed of medium chain triglycerides, egg yolk lecithin, polysorbate 80 and water were prepared by spontaneous emulsification procedure. The coumestrol permeation/retention was carried out with porcine ear skin using Franz diffusion cells. Samples were withdrawn at different intervals. The epidermis was separated from the dermis and the amount coumestrol permeated and retained in skin layers was determined by LC. The antioxidant activity was determined by hydrogen-donating ability of coumestrol to free radical stable DPPH•. All experiments were done in triplicate and analyzed by student t-test.

Results/discussion: Coumestrol was detected preferentially into the epidermis (approximately 10 µg/g of epidermis) when compared to dermis. No significant differences of coumestrol retention were detected after 8 or 24h kinetics (p>0.05) and no coumestrol was detected in receptor fluid. About 70% of DPPH reduced was achieved with 300 µg /ml of ethanolic solution of coumestrol and the IC₅₀ was 89.38 µg/ml. The ability to scavenge DPPH• was maintained when coumestrol was incorporated into nanoemulsions, showing that the components of the formulations did not interfere with the molecule's electron donor ability.

Conclusion: The antioxidant activity presented by coumestrol-loaded nanoemulsion and the preferential retention of coumestrol into epidermis demonstrates that this system is a promising carrier for topical delivery of this molecule.

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