Reduction of UV-induced Photo-oxidation in Cosmetic Emollients Based on Vegetable Oils

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This study was conducted in order to demonstrate the effects of tocopherols and phytosterols on the oxidative stability of a vegetable oil based emollient using simulated daylight, free access to oxygen and at body temperature. In a second step the protective effects on keratinocyte cultures under oxidative stress was also shown.

The test substance is a partially hydrogenated and fractionated rapeseed oil (PHFCO, INCI: Canola), characterised by a high content of monounsaturated fatty acids in combination with elevated levels of tocopherols (300 ppm alpha- and 600 ppm gamma-tocopherol) and phytosterols (7000 ppm). In an in-vitro experiment, using combinations of soybean oil with either PHFCO (protective emollient) or caprylic/capric triglycerides (inert emollient), oil blends were subjected to simulated daylight from a fluorescent tube for 8 hours at 35 °C. The peroxide value, was determined after 1, 2, 4 and 8 hours of irradiation. The protective effects were further investigated in an in-vitro test using epidermal keratinocytes (EpiDerm™) treated with PHFCO and irradiated with simulated solar UV radiation. Three endpoints were used for estimating the efficacy of PHFCO: protein oxidation measured by carbonyl formation 2 hours after irradiation, IL-1alpha and lactate dehydrogenase (LDH) release 24 hours after irradiation.

Results

The peroxide value in pure PHFCO with approximately 6% of linoleic acid increases about three times compared to the original value during the 8 hour test . The mixture of soybean oil and caprylic/capric triglycerides with 10% linoleic acid shows an increase about 9 times the original value. When mixed with PHFCO the peroxide value increase is only slightly higher than for pure PHFCO,

The protective effect was confirmed in this study expressed as the reduction of the protein carbonyl formation after an oxidative stress caused by UV radiation. PHFCO, as an “active” emollient gives a clear advantage over the inert caprylic/capric

triglyceride which does not inhibit the protein oxidation at all. Furthermore, PHFCO also depresses the inflammatory reaction caused by the UV irradiation, expressed as a reduction of cytokine IL-1alpha release. As expected, the caprylic/capric triglyceride did not give any significant decrease of cytokine release since this inert emollient does not contain any anti-inflammatory constituents. The cell viability expressed as LDH release after irradiation was clearly increased by the PHFCO treatment while no protection was seen with the caprylic/capric triglyceride.