Lipid Uptake and Skin Occlusion Following Topical Application of Oils on Adult and Infant Skin

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INTRODUCTION

Topical application of oils and oil-based formulations is common practice in skin care for both adults and infants. Only limited knowledge however is available regarding the skin penetration and the occlusive potential of oils and common methods for measuring skin moisturization fall short when it comes to the moisturizing effect of oils. In this study we used in vivo confocal Raman microspectroscopy to test the efficacy of paraffin oil (mineral oil) and two vegetable oils in terms of skin penetration and occlusion. Petrolatum was used as a positive control.

METHODS

The products were applied topically on the forearms of 9 volunteers and 7 infants and Raman spectra were acquired before and at 30 and 90 min following application. Depth concentration profiles for lipid and water were calculated from the Raman spectra. Skin occlusion was assessed from the amount of stratum corneum (SC) swelling measured from the water concentration profiles.

RESULTS

The paraffin oil and the vegetable oils penetrate the top layers of the SC with similar concentration profiles, a result that was confirmed both for adult and infant skin. The three oils tested demonstrated modest SC swelling (10-20%) compared to moderate swelling (40-60%) for petrolatum.

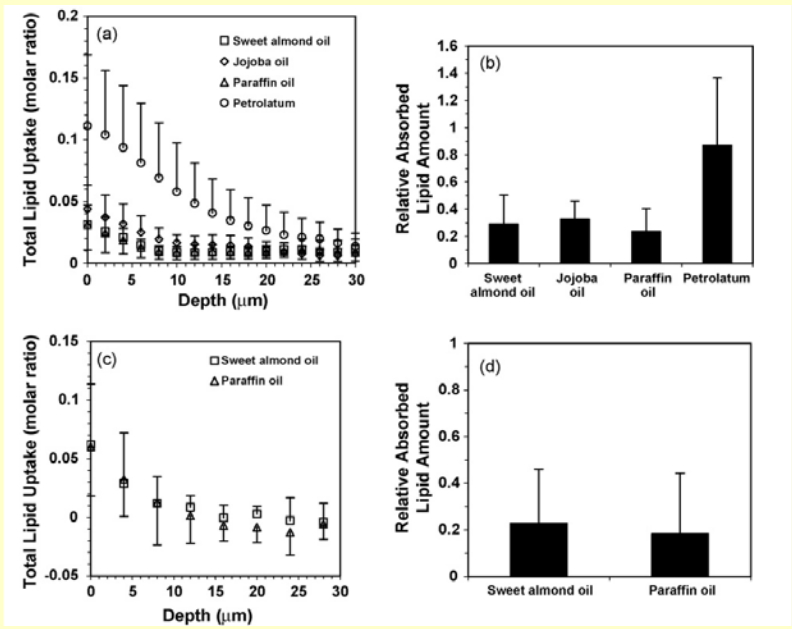

Figure 1. (a) Lipid concentration profiles for adult skin after subtraction of baseline values. (b) Relative lipid amount absorbed for adult skin in the first 30 μm, 30 min following application. Lipid uptake for petrolatum was statistically higher compared to each of the other treatments. (c) Lipid concentration profiles for infant skin after subtraction of baseline values. (d) Relative lipid amount absorbed for infant skin in the first 30 μm, 30 min following application. There is no statistical difference between the two oils tested.

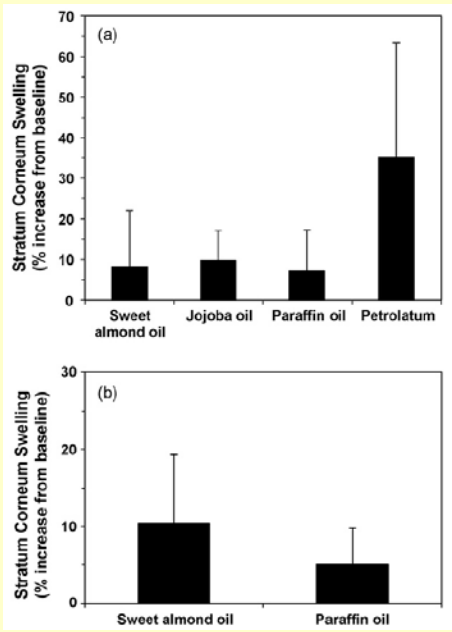

Figure 2. (a) Relative increase in the stratum corneum thickness of adult skin at 30 min following treatment. The value for petrolatum was statistically higher compared to each of the other treatments. (b) Relative increase in the stratum corneum thickness of infant skin at 30 min following treatment. There is no statistical significance between the two oils tested.

CONCLUSION

These data indicate that there is no statistical difference between the paraffin oil and vegetable oils in terms of skin penetration and skin occlusion. The results for petrolatum show that in vivo confocal Raman microspectroscopy is sensitive and specific enough to measure both lipid uptake and skin occlusion events following topical application.

For further details see: Stamatas et al., J Derm Sci, 50(2), 135-142, 2008