

MONITORING OF SKIN RESPONSE FOLLOWING THE TOPICAL ADMINISTRATION OF VESICULAR DRUG DELIVERY SYSTEMS

Antonia Mancuso¹, Maria Chiara Cristiano², Christian Celia³, Donatella Paolino², Massimo Fresta¹

¹Department of Health Sciences, University "Magna Græcia" of Catanzaro, Campus Universitario "S. Venuta" - Building of BioSciences, I-88100, Catanzaro, Italy;

²Department of Experimental and Clinical Medicine, University "Magna Græcia" of Catanzaro, Campus Universitario "S. Venuta" - Building of BioSciences, I-88100, Catanzaro, Italy;

³Department of Pharmacy, University of Chieti – Pescara "G. d'Annunzio", Via dei Vestini 31, I-66100, Chieti, Italy.

Email: antonia.mancuso@unicz.it; fresta@unicz.it

Topical drug delivery systems have a significant relevance in the therapeutic field because they enhance skin permeation/accumulation of the carried drugs, thus improving their therapeutic efficacy. Any changes in the stratum corneum lipid structure, that can occur during the skin permeation of these systems, can be monitored by evaluating the Transepidermal Water Loss (TEWL), the main indicator of skin integrity. In this study, colloidal nanocarriers, having suitable biopharmaceutical properties for skin delivery (niosomes, ethosomes[®] and transfersomes[®]) were administered on skin and in vitro and in vivo evaluations of TEWL values were performed both in occlusive and non-occlusive conditions using In-vitro Tewameter[®] VT310 and Tewameter[®] TM 300 probes. Results showed an initial alteration of TEWL values followed by a gradual restoration of the native skin structure until 72 h from the application of vesicles. The administration of nanosystems in occlusive condition produced higher initial TEWL values, both for in vitro (up to 20 g/m² × h) and in vivo (above 20 g/m² × h) studies, nonetheless showing a restoration of the original values within 72 h from the administration. Changes in TEWL values were influenced by the composition of nanovesicles, the experimental conditions and incubation times. Data suggest that niosomes, ethosomes[®] and transfersomes[®] are safe carriers for topical application, able to increase the percutaneous permeation of drugs without causing permanent damage to the native skin structure.

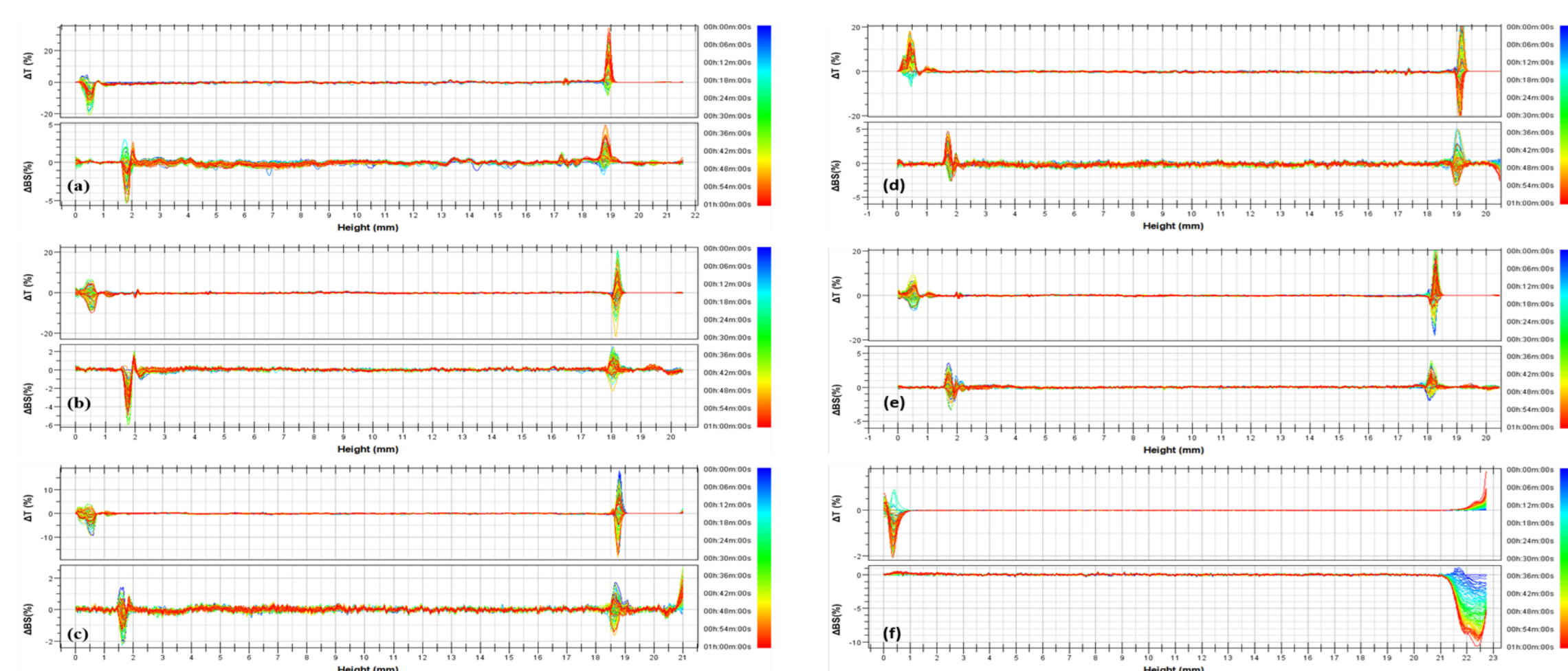
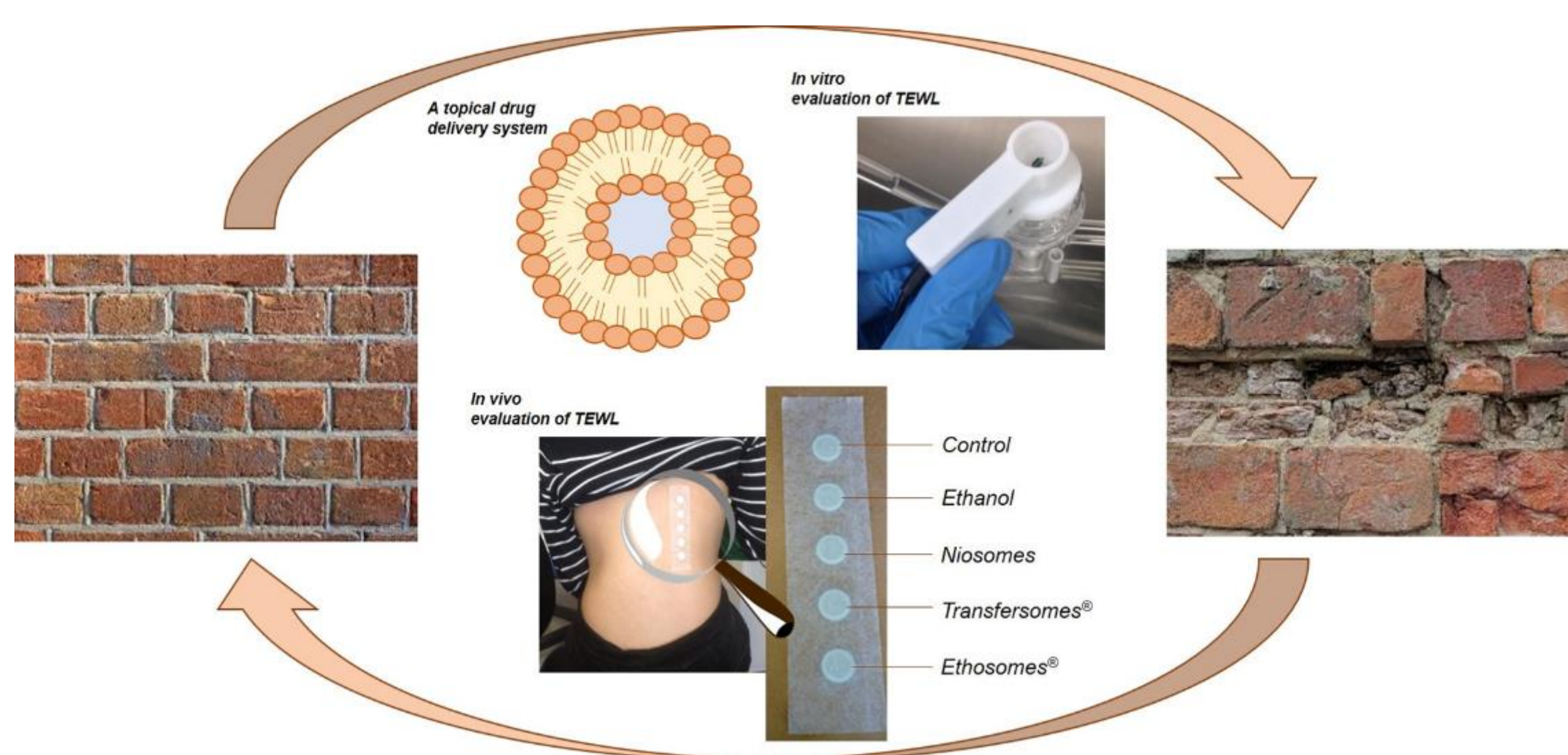


Fig. 1. Turbiscan Lab[®] Expert analysis. Delta transmission (Δt) and delta back scattering (Δbs) profiles of niosomes (a, d), transfersomes[®] (b, e) and ethosomes[®] (c, f) at 25°C (left side) and 37°C (right side), are reported as a function of time (0-1 h) and sample height (8 mm).

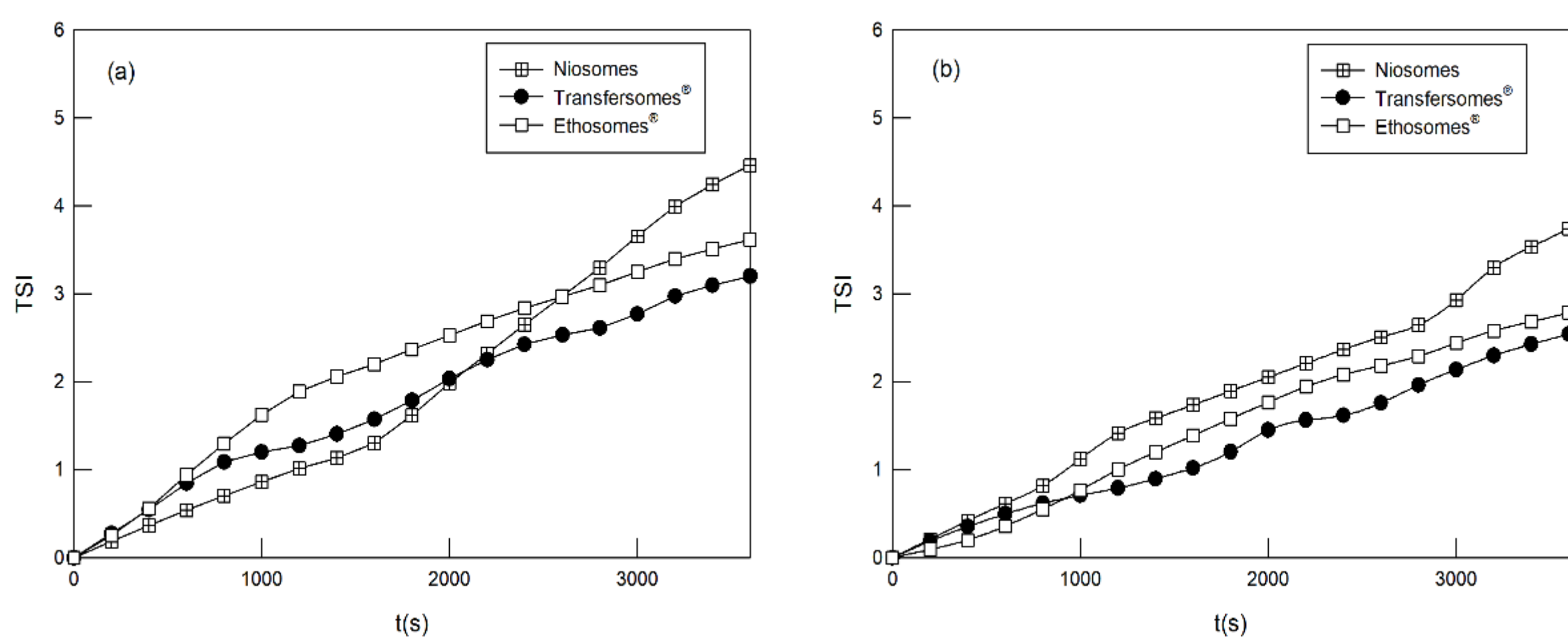


Fig. 2. Turbiscan Stability Index (TSI) of niosomes, transfersomes[®] and ethosomes[®] at 25°C (a), on the left and 37°C (b), on the right after 1 h of analysis. EasySoftware allows to associate the stability measurement with a number. Different nanoformulations are stable and have TSI values closed to the base line of the analysis

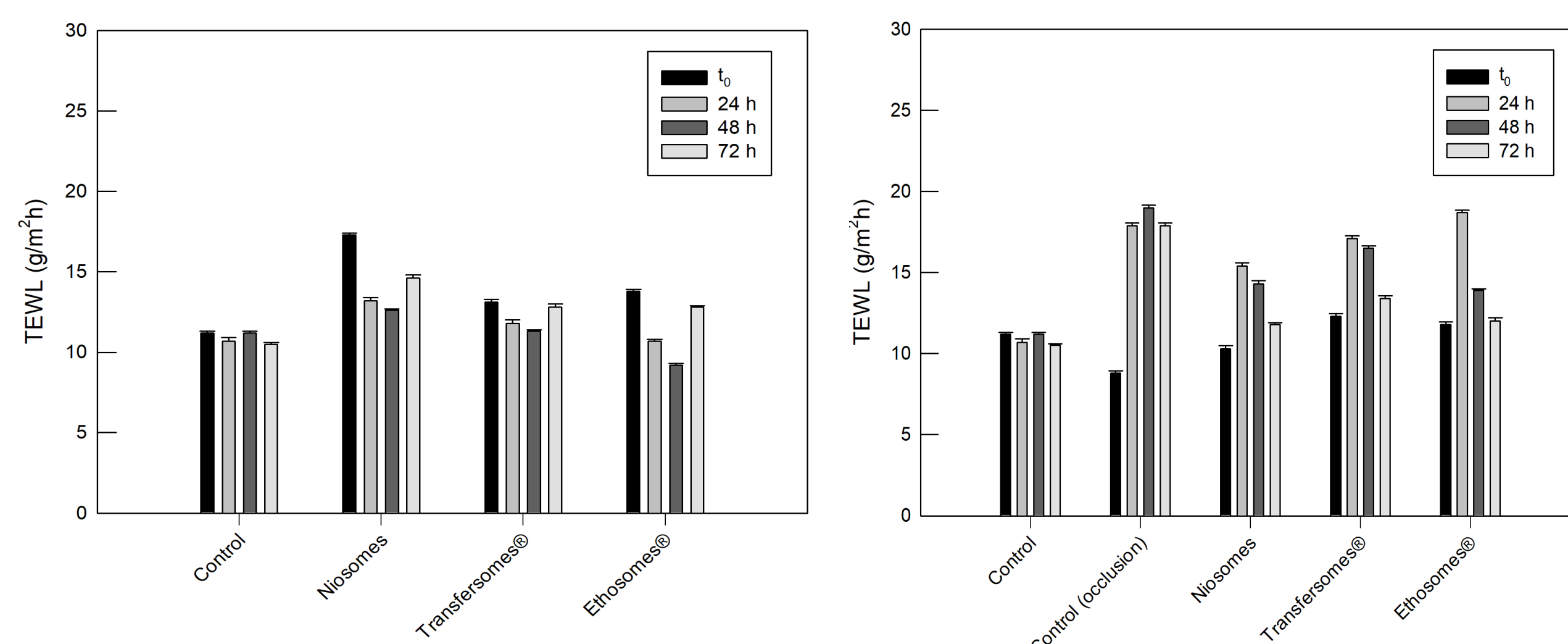


Fig. 3. *In vitro* TEWL values of niosomes, ethosomes[®] and transfersomes[®] topically applied on the SCE membrane models in non-occlusive conditions. Results are the average of three different independent experiments \pm standard deviation. If bar is not reported, it is within the column.

Fig. 4. TEWL values of niosomes, ethosomes[®] and transfersomes[®] topically applied on the SCE membrane models in occlusive conditions. Results are the average of three different independent experiments \pm standard deviation. If bar is not reported, it is within the column.

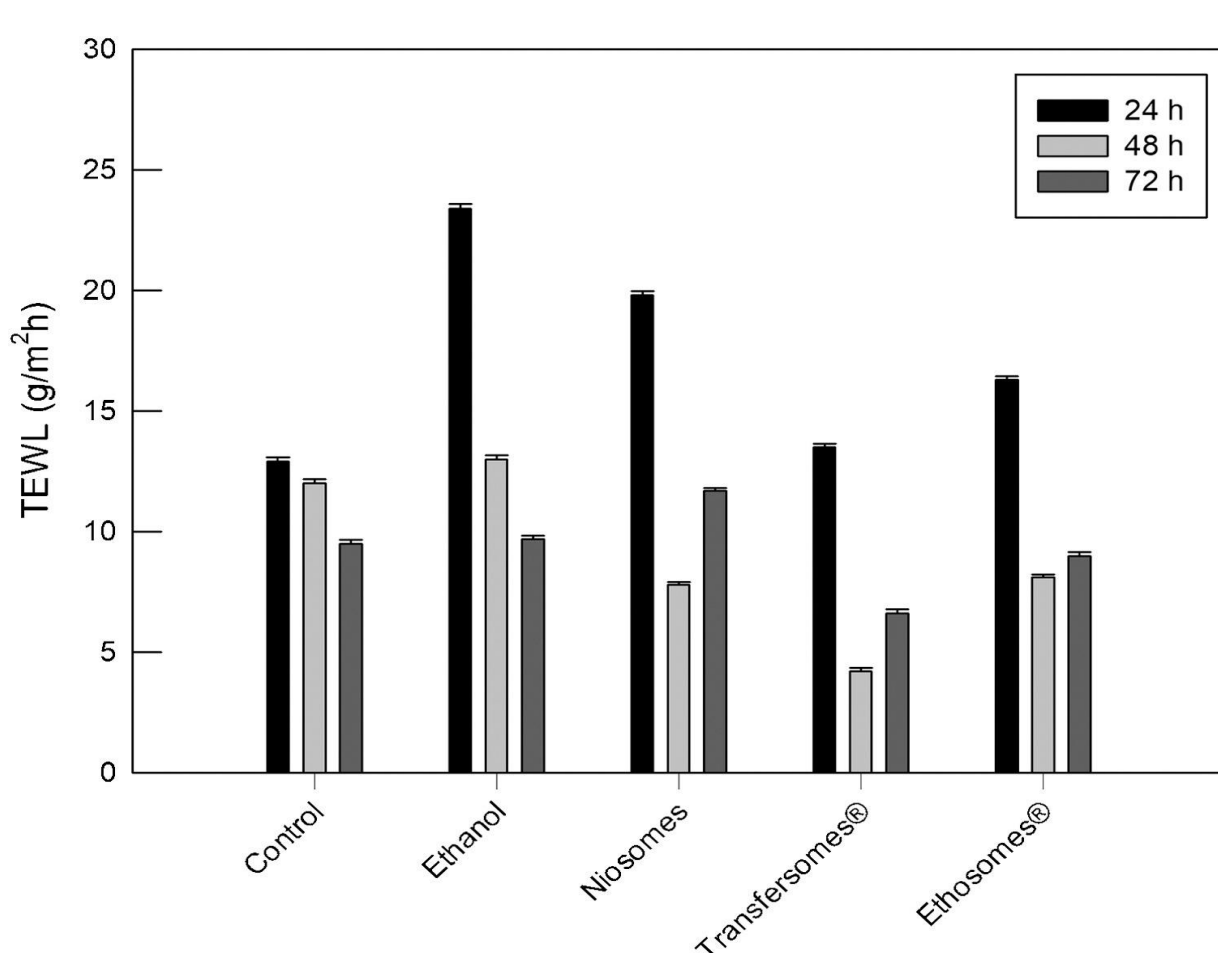


Fig. 5. TEWL values of niosomes, ethosomes[®] and transfersomes[®] topically applied on healthy human volunteers (n = 10) in non-occlusive conditions. Results are the average of three different independent experiments \pm standard deviation. If bar is not reported, it is within the column.

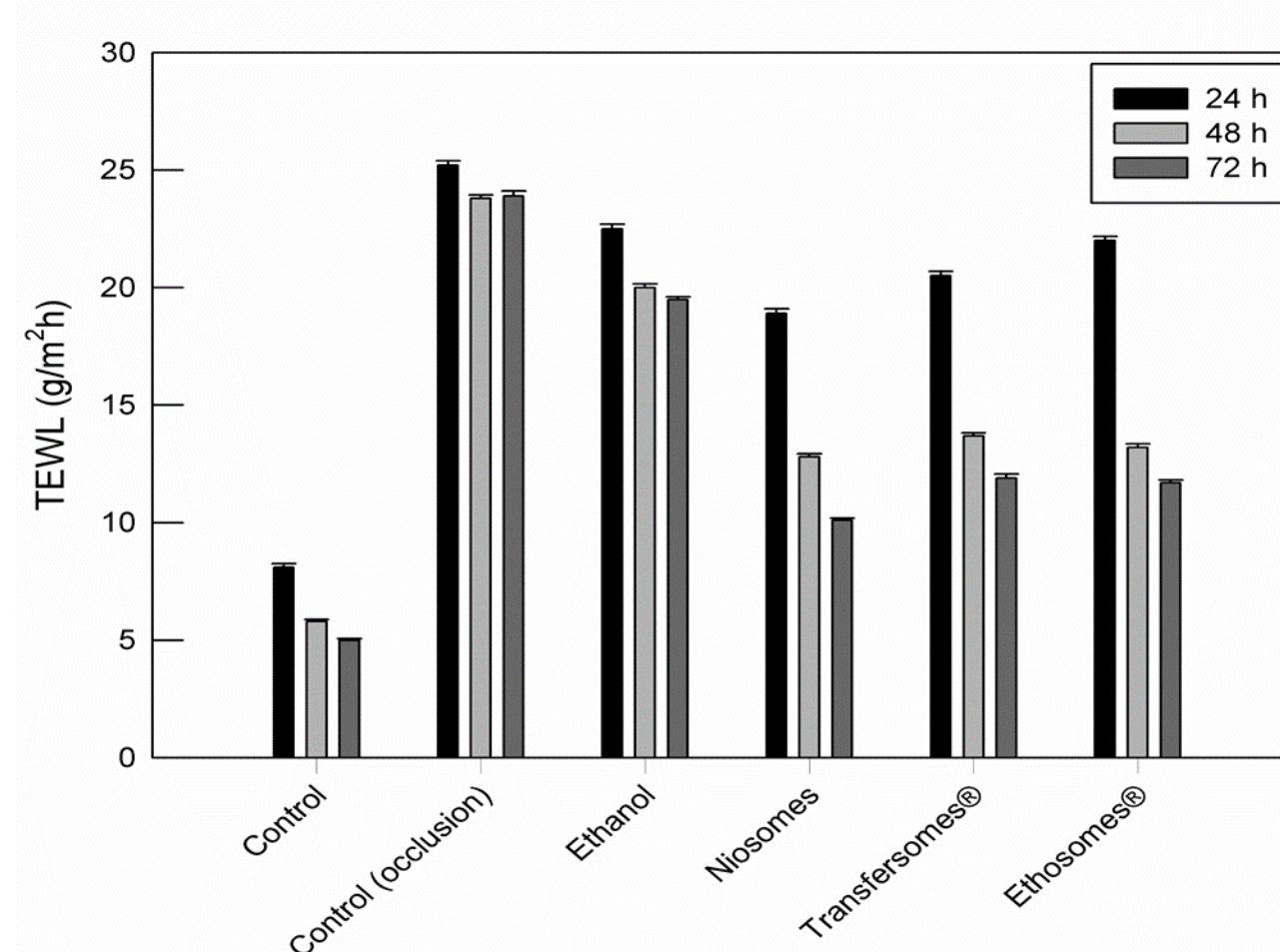


Fig. 6. TEWL values of niosomes, ethosomes[®] and transfersomes[®] topically applied on healthy human volunteers (n = 10) in occlusive conditions. Results are the average of three different independent experiments \pm standard deviation. If bar is not reported, it is within the column.