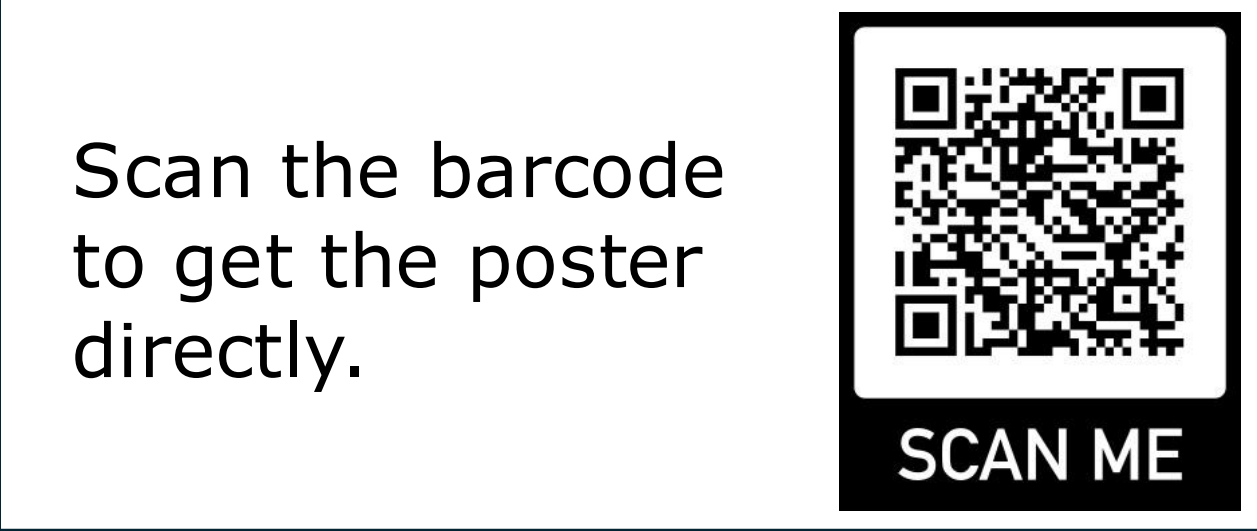


Science meets efficacy: skin barrier improvement after a three-day treatment with lipid-rich skin care



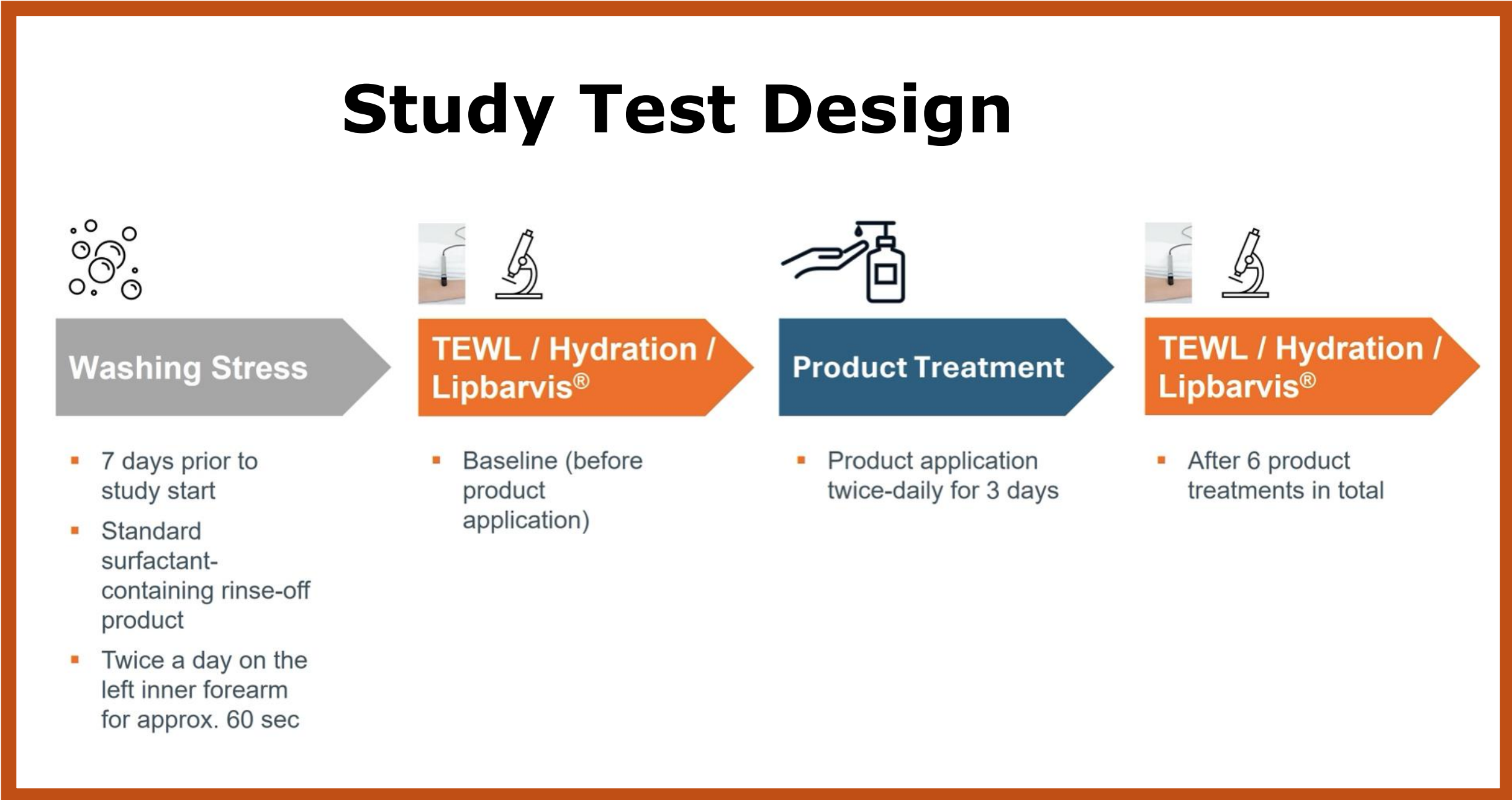
Stephan Dähnhardt-Pfeiffer¹, Dr. Dorothee Dähnhardt¹, Inge Holland², Isabel Simon², Andrea Weymann², Dr. Peter Staib², Dr. Dörte Segger³, Dr. Dana Ditgen³

¹ Microscopy Services Dähnhardt GmbH, Plambeckskamp 2 24220 Flintbek, Germany.
² Kneipp GmbH, Winterhäuser Straße 85, 97084 Würzburg, Germany
³ SGS INSTITUT FRESENIUS GmbH, Hamburg, Germany



Introduction:

The skin barrier plays a crucial role in protecting against external influences. Dry skin suffers from a disturbed lipid balance, which leads to moisture loss and increased sensitivity. The study presented here, investigates the efficacy of a lipid-rich skin oil in improving skin hydration and epidermal barrier function after a short application period of three days. 32 subjects with dry skin used a skin oil twice a day for three days. The performed methods included TEWL, skin hydration, lipid analysis and the determination of the lipid lamellar length in the intercellular space using electron microscopy (Lipbarvis®).



Results:

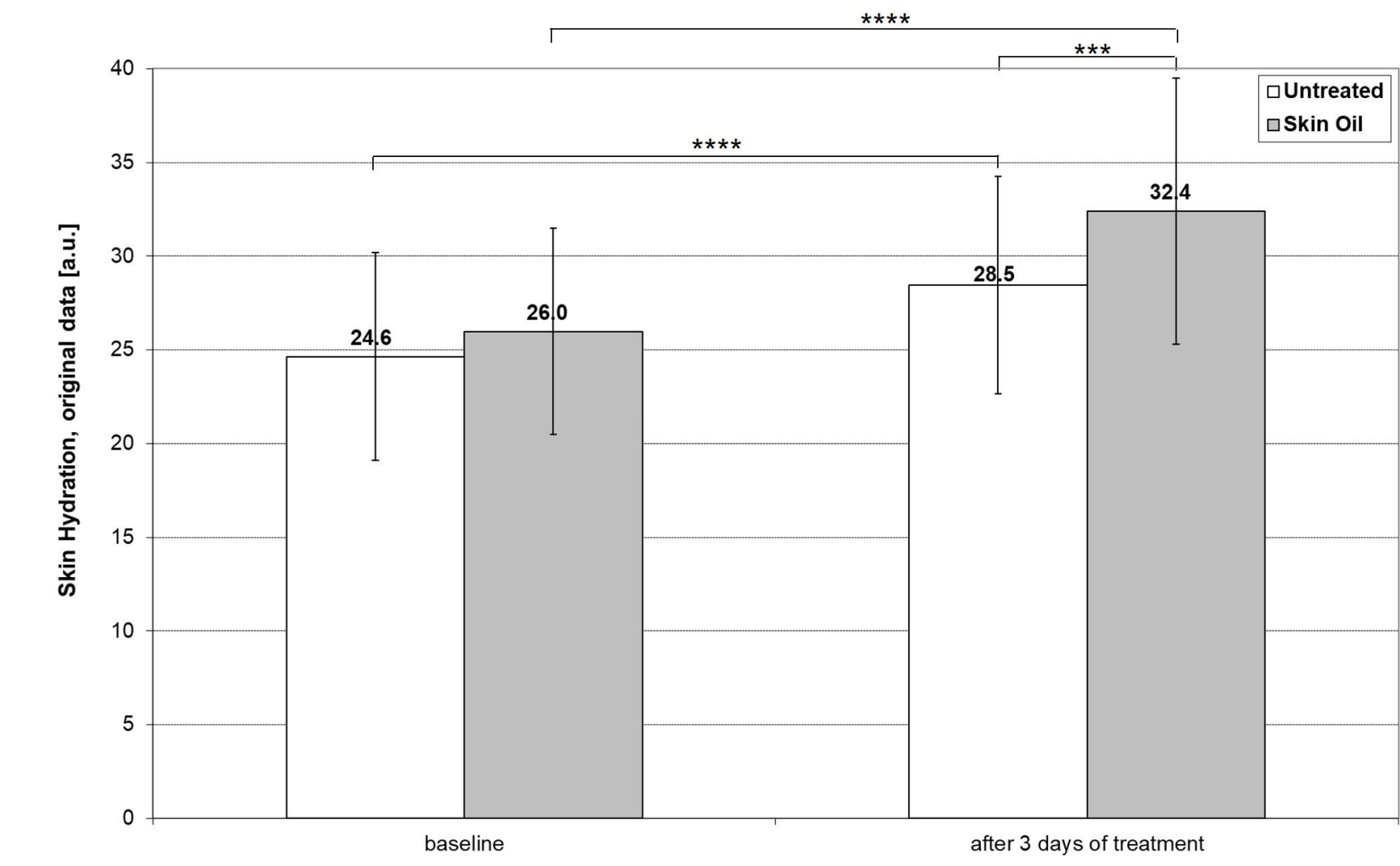


Figure 1: Skin hydration measurements after three days of treatment with a caring skin oil. Two-sided T-Test for dependent samples for comparison between time points and treatment regimes, ***p < 0.001, ****p < 0.0001, n = 32.

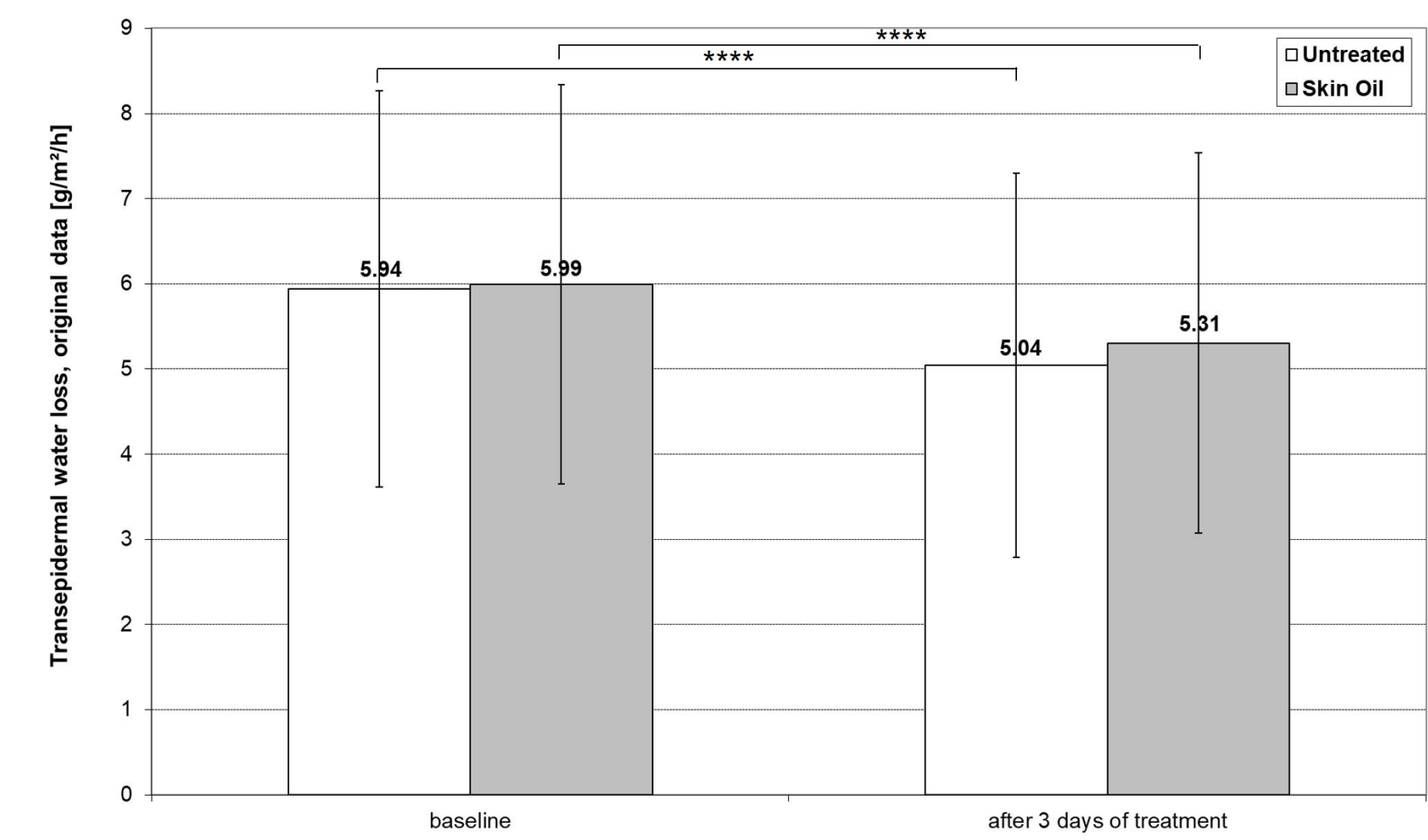


Figure 2: Transepidermal water loss measurements after three days of treatment with a caring skin oil. Two-sided T-Test for dependent samples for comparison between time points and treatment regimes, ****p < 0.0001, n = 32.

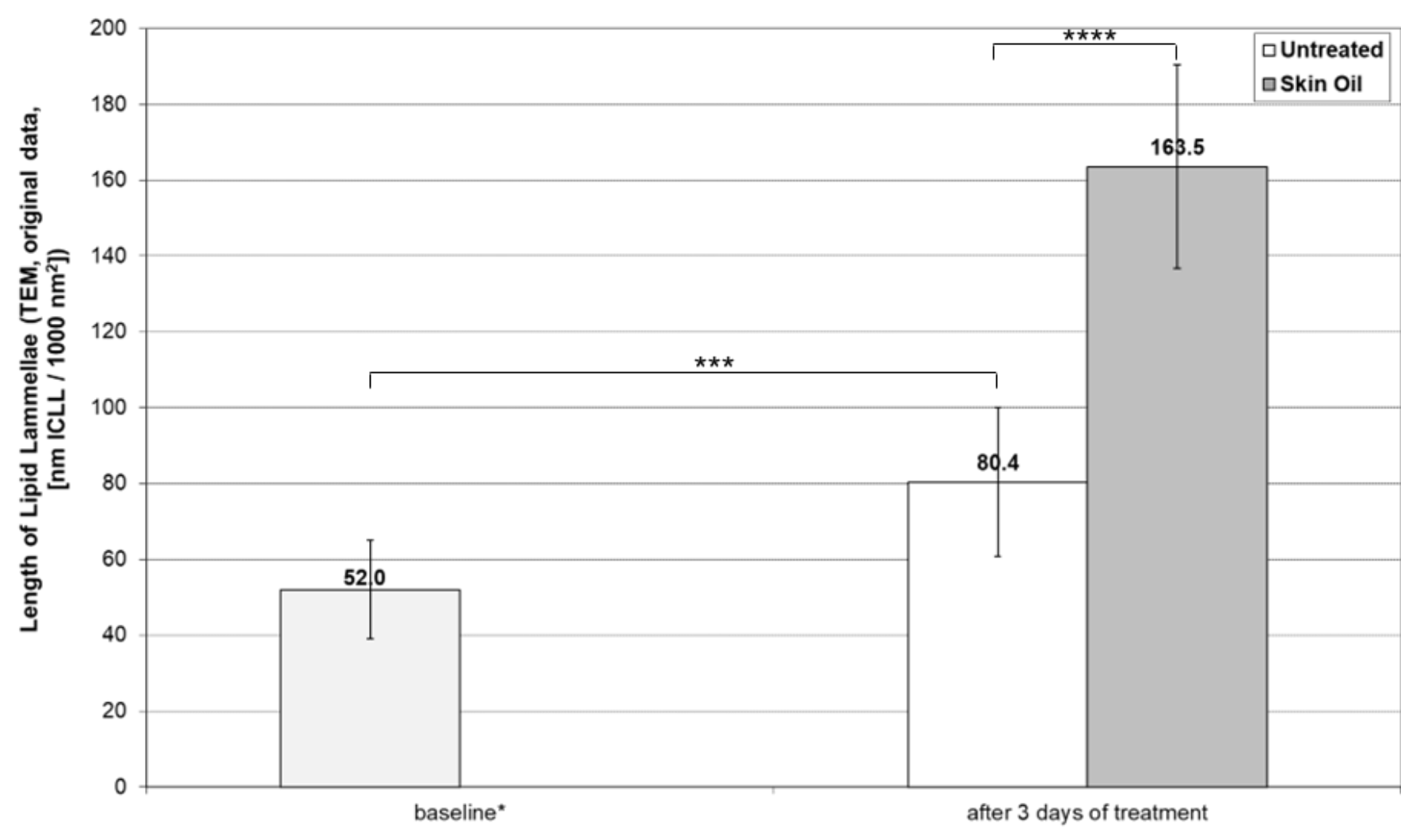


Figure 3: Normalized intercellular space lipid lamellae (nICLL) before and after three days of product treatment with a caring skin oil. * At baseline the skin between the untreated test site and the test site to be treated with skin care oil was sampled. Two-sided T-Test for dependent samples for comparison between time points and treatment regimes, ***p < 0.001, ****p < 0.0001, n = 12.

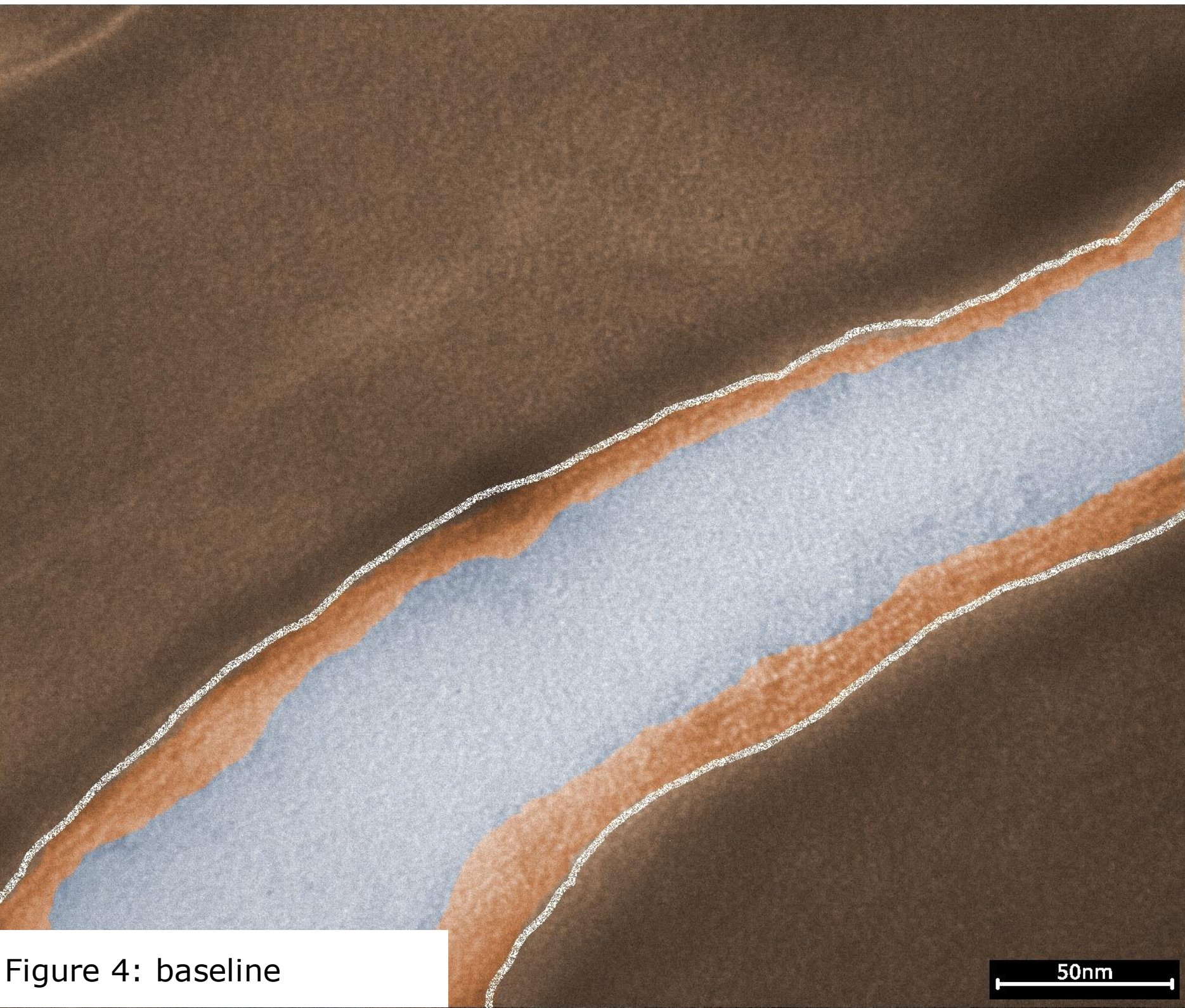


Figure 4: baseline

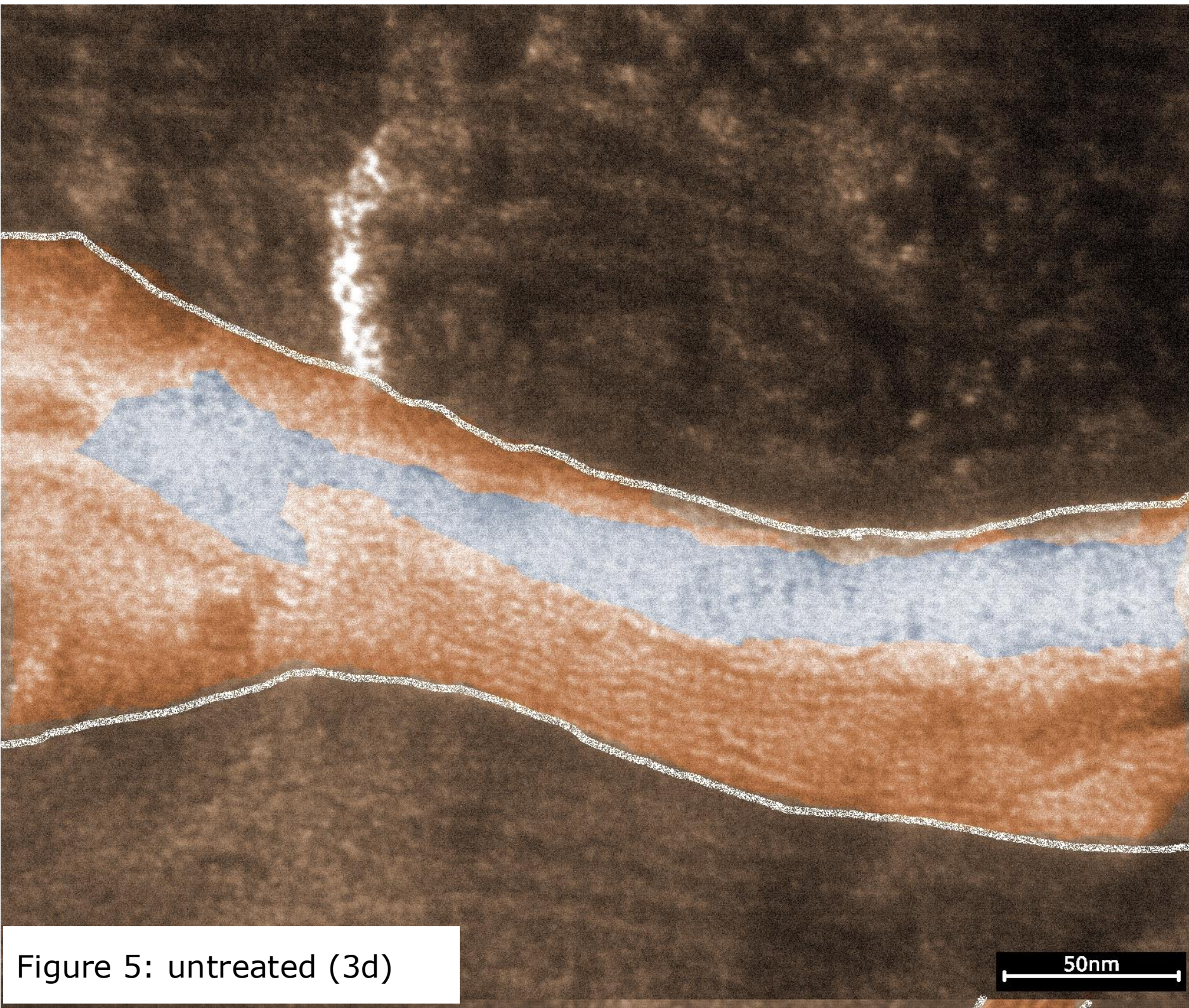


Figure 5: untreated (3d)

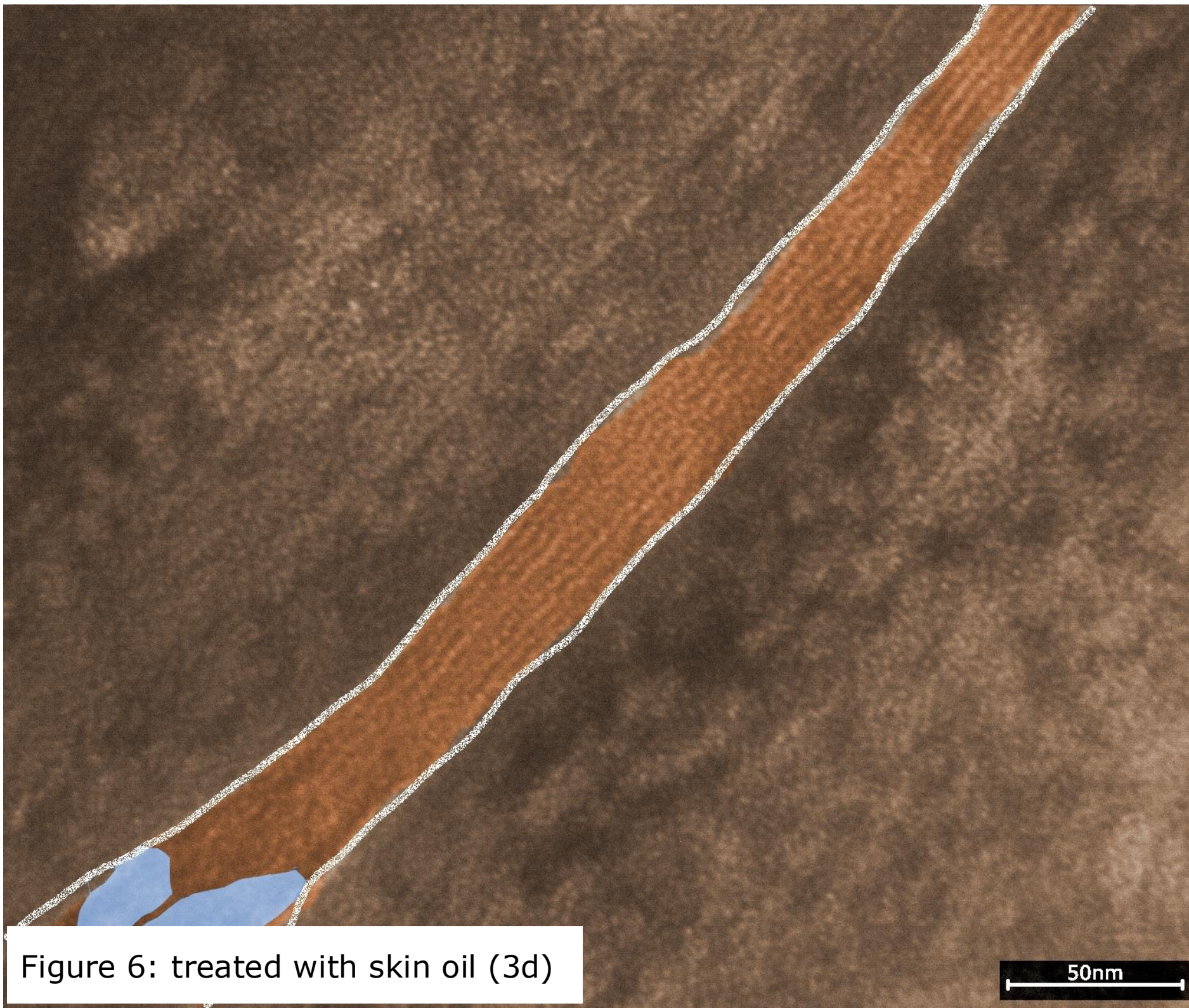


Figure 6: treated with skin oil (3d)

Figure 4/5/6: TEM images of the intercellular lipid lamellae in the intercellular space of the stratum corneum at baseline (Fig.4) on the skin between the untreated test site (Fig.5) and the test site treated with skin care oil (Fig.6). The lipid lamellae in the intercellular space are colored light brown, while areas with little to no lipid lamellae are colored blue. The corneocytes adjacent to the intercellular space are stained dark brown.

Summary / Conclusion:

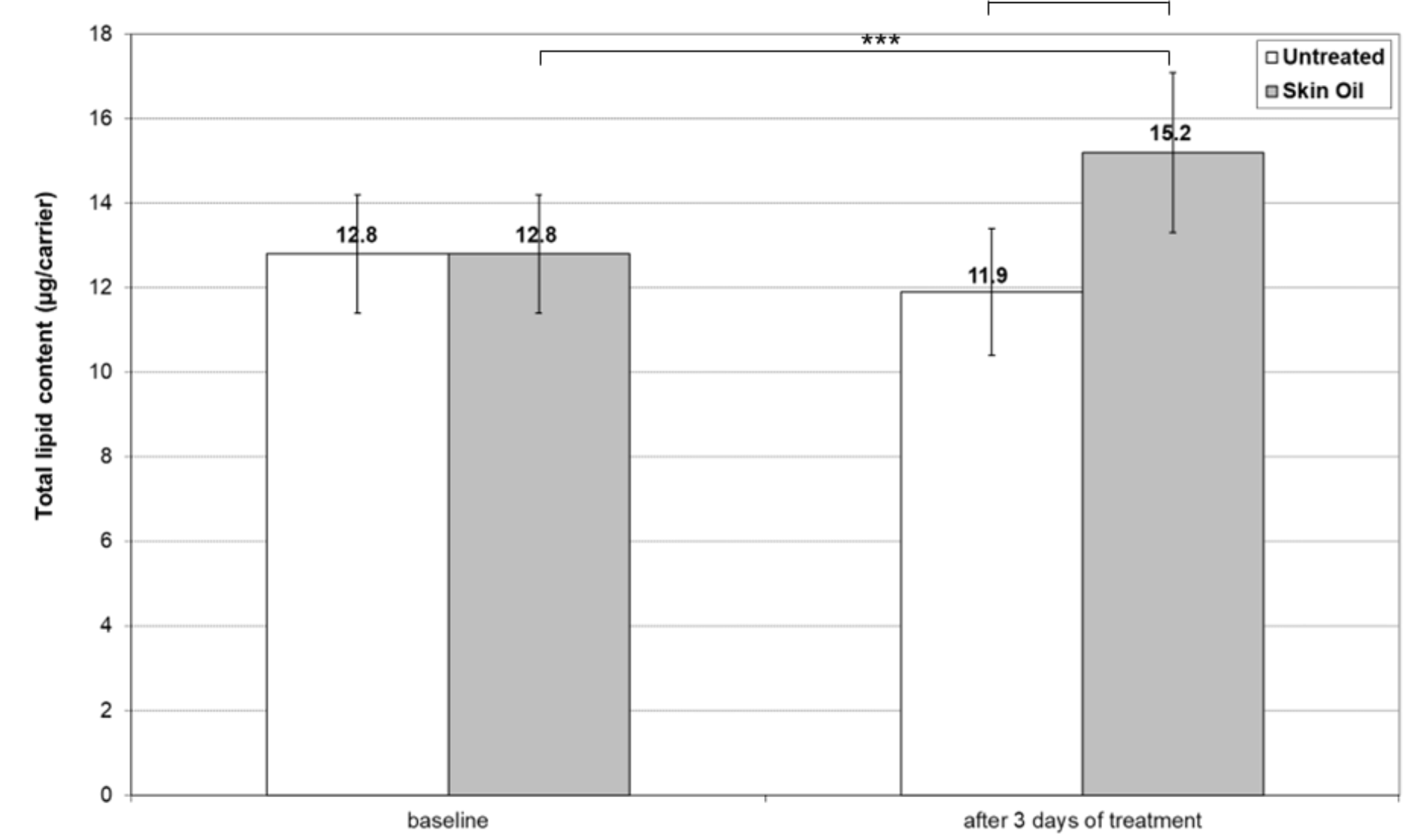


Figure 7: Total lipid content (µg lipids / carrier) after skin pre-treatment with a shower gel (baseline) and after three days of either skin oil application or no treatment. Two-sided T-Test for dependent samples for comparison between time points and treatment regimes, ***p < 0.001, n = 12.

The lipid-rich skin oil formulation demonstrated strong regenerative potential by restoring lamellar lipid organization and significantly enhancing stratum corneum (SC) hydration. The ongoing regeneration processes, such as water flux into the upper skin layers to support NMF synthesis and protein structure repair, may explain the improved hydration despite a TEWL reduction not distinct from the untreated control. The total SC lipid content increased significantly compared with untreated, driven by statistically significant increases in individual lipid classes: cholesterol (+28%), free fatty acids (+14%), ceramides EOS (+20%), and NP (+17%). Overall, the findings underscore the role of cosmetic formulations in supporting early phases of skin barrier repair and maintaining skin health and resilience.