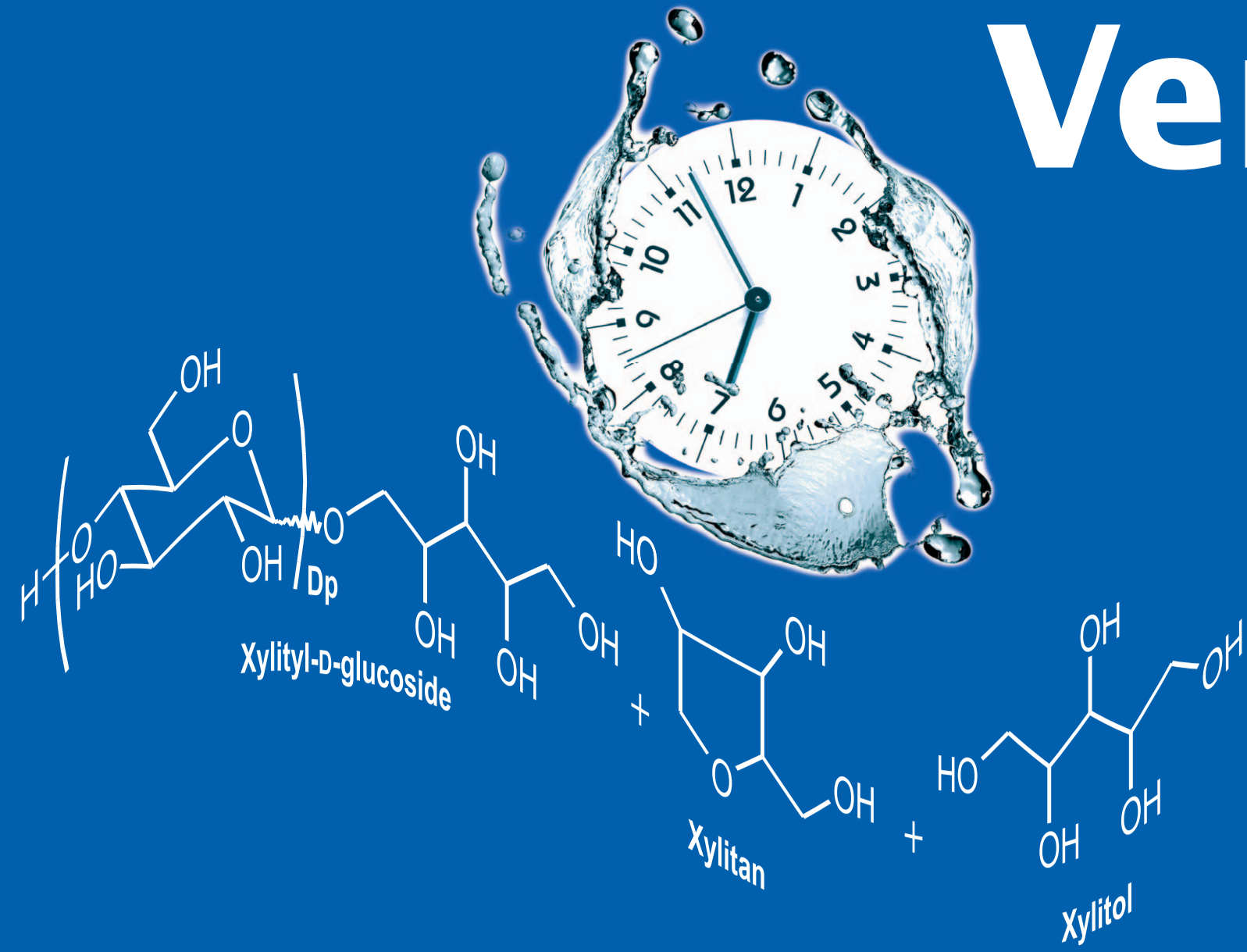# Versatile performance of a sugar-based moisturizer in naturally-based skin care formulas

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INTRODUCTION

Moisturizing effect is a universal key driver of customer satisfaction, as the benefit is quickly perceived and easily visible. The development of optimized moisturizing performance is also linked to the right choice of the formulation base [1, 2]. However, from a practical and economical point of view, a good moisturizing active ingredient should be efficient in every formula base, allowing the formulator to experiment with versatile textures and targeted sensory profiles. The purpose of this study is to investigate the performance flexibility of an easy-to-use liquid sugar-based moisturizer, *in vivo* on very dry skin, in several simple and natural gels or emulsions.

MATERIALS AND METHODS

► Raw materials and formulas

The sugar-based moisturizer (INCI name: Xylitylglucoside & Anhydroxylitol & Xylitol, available from SEPPIC) was introduced in a simple natural gel and in O/W emulsions shown *in table 1*.

Formulation controls: characteristics, stability for 3 months at room temperature and 45°C, microbial safety and skin tolerance.

FUNCTION	INGREDIENT INCI NAME	G-M	E1-C	E1-M	E2-C	E2-M	E3-C	E3-M
	FORMULA REFERENCE →			DOSE (% w/w)				
EMULSIFYING SYSTEM	**Cetearyl Alcohol & Cetearyl Glucoside*****	0	3	3	0	0	0	0
	C14-22 Alcohols & C12-20 Alkyl Glucoside**	0	0	0	3	3	0	0
	Steareth-2 / Steareth-21 / Cetearyl Alcohol (1/1/1)*	0	0	0	0	0	3	3
OILS	Sweet Almond Oil				8			
	Coco Caprylate/ Caprate				5			
	Dicaprylyl Carbonate				2			
STABILIZER	**Acacia Senegal Gum & Xanthan Gum*****				1.5			
WATER					Up to 100			
MOISTURIZER	**Xylitylglucoside & Anhydroxylitol & Xylitol****	3	0	3	0	3	0	3
PRESERVATIVES	Dehydroacetic Acid & Benzyl Alcohol				0.8			
	Dehydroacetic Acid				0.2			
FRAGRANCE					0.1			
BUFFER	(Citric Acid or Sodium Hydroxide)				Up to pH 5–5.5			

*** Compliant to Ecocert & COSMOS & NaTrue labels (Available from SEPPIC)
** Compliant to Ecocert & NaTrue labels
* Non natural benchmark (Available from BASF)

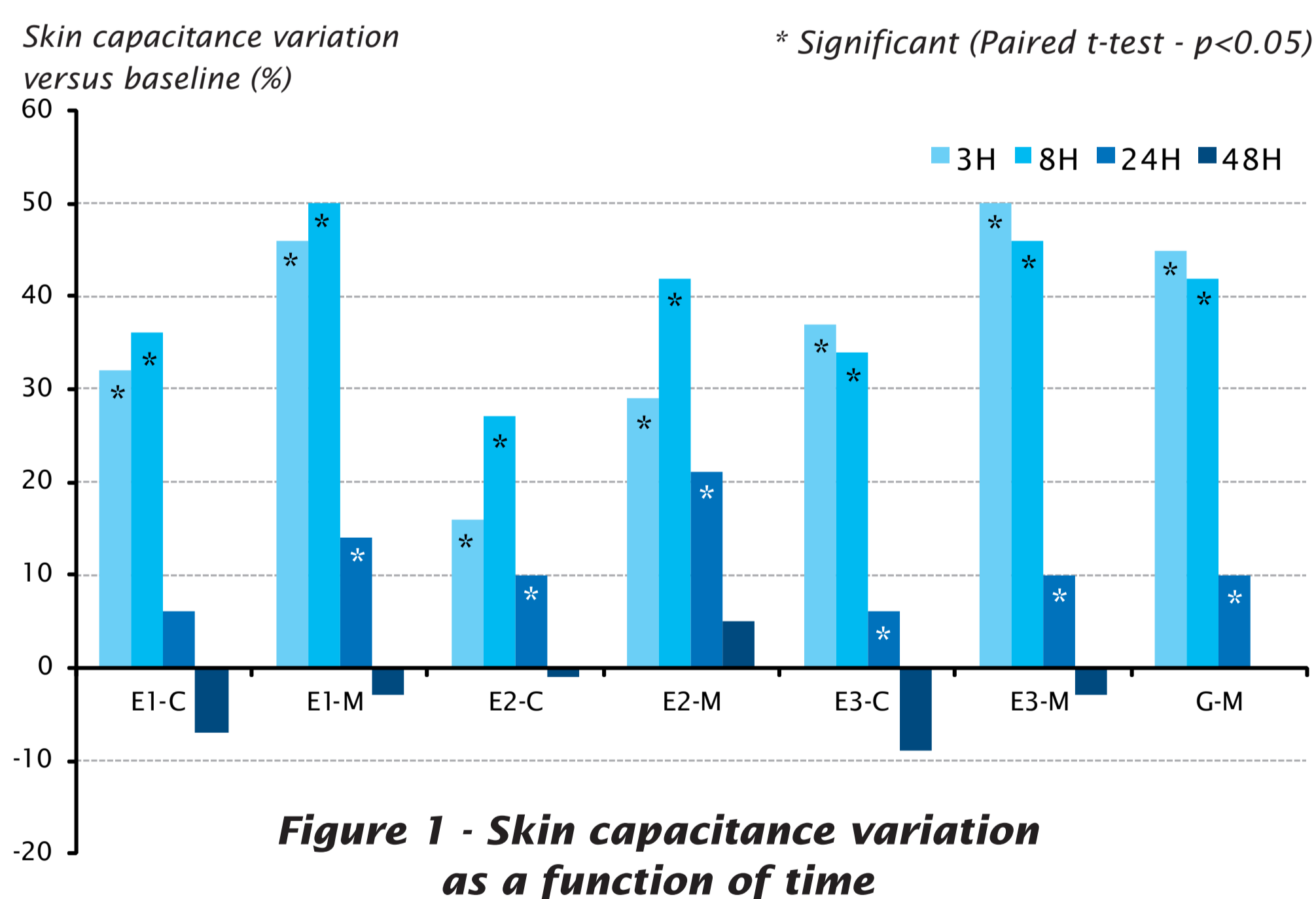**Table 1 – Tested formulas**

► Clinical study

Corneometry protocol on a panel of 50 women (mean age of 57.8 years-old), selected with very dry skin (<30ui with visible flakes, Skin capacitance using Corneometer® CM 825, Courage&Khazaka – randomized application sites on lower legs (shin)):

- Measure before application, at 3 hours, 8 hours, 24 and 48 hours after a unique standardized application of 2mg/cm2 on each area
- Evolution of the skin surface followed with dermatoscopy (Digital camera Canon EOS 5D Mark II, Canon, associated to DermLiteTM Foto, 3Gen LLC - dermatoscopic images blinded ranked by five trained readers on a scale from 1 for the minimum dryness/flakes to 5 for the maximum dryness/flakes).
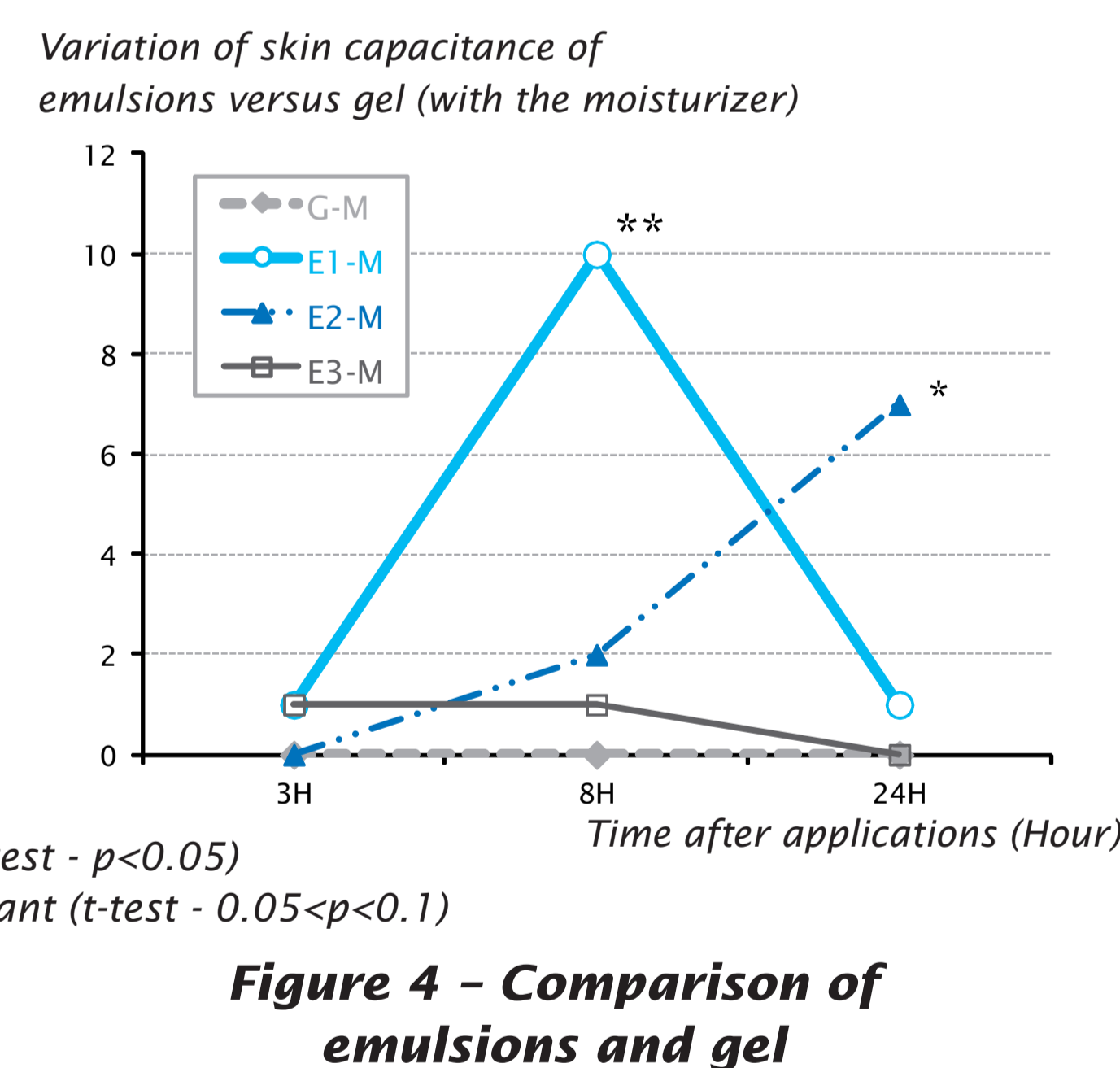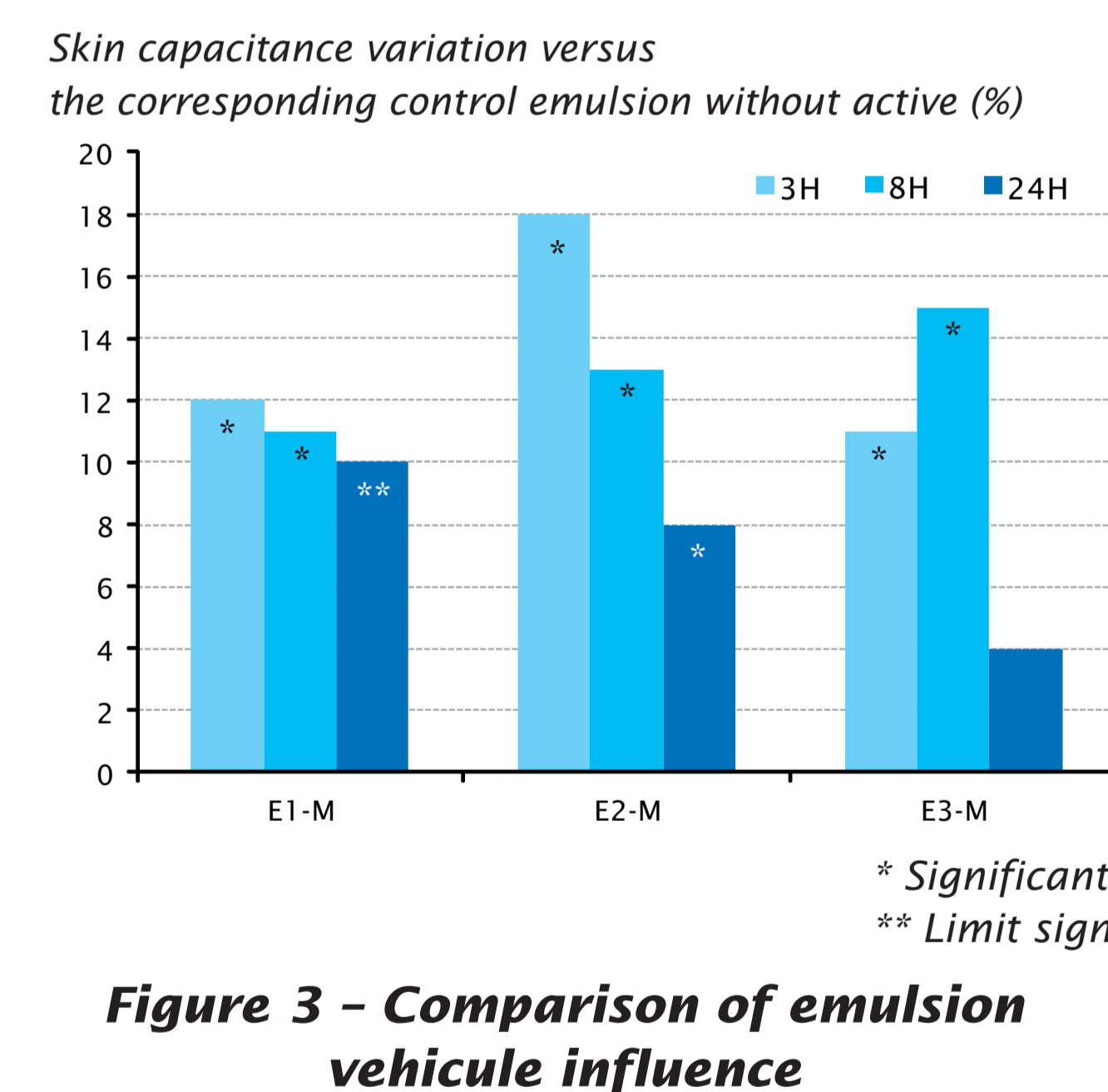
RESULTS

► Comparison before and after treatment

- Compared to the same zone before treatment *(figure 1)*, all the formulas demonstrate a moisturizing effect.
- Control emulsions, without an active (E1-C, E2-C, E3-C) show, at least, significant improvement up to eight hours (duration more or less dependent on composition).
- Formulas with the active (E1-M, E2-M, E3-M, G-M) reveal a longer lasting effect, significant up to twenty four hours.

Figure 1 - Skin capacitance variation as a function of time

► Comparison to the non-treated zone

- Confirmation the diverse efficacy of the control emulsions as a function of time *(figure 2)*.
- Confirmation of the efficacy of all the formulas containing the active ingredient, both gel and emulsions.

Figure 2 – Skin capacitance variation versus non treated zone
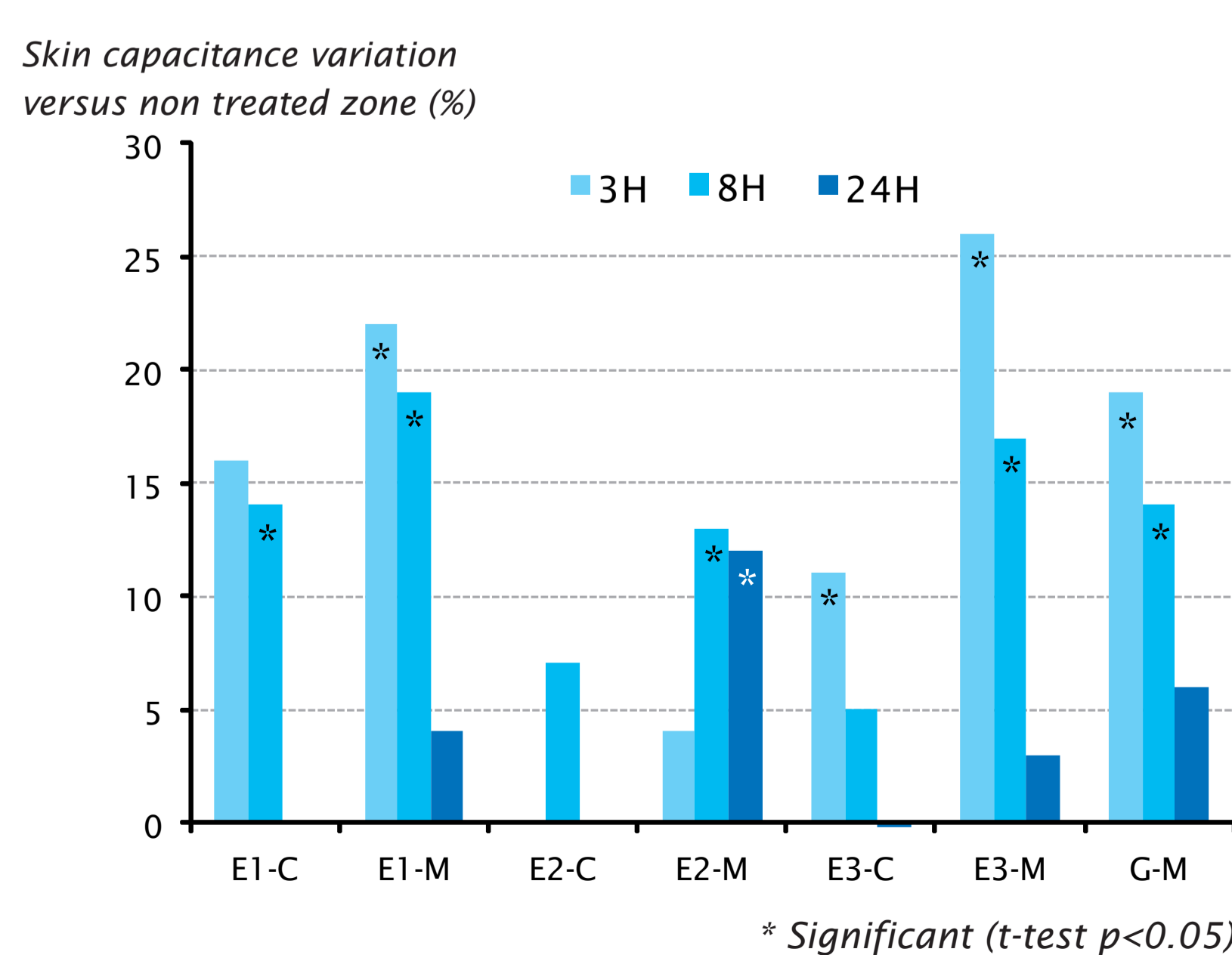
► Comparison to the control formula - Gel versus emulsion

- Significant improvement of the emulsions containing the active compared to their corresponding control *(figure 3)*: up to twenty four hours for the emulsions with the natural glucolipid emulsifiers (E1-M & E2-M) and up to eight hours for the non natural benchmark (E3-M).
- Similar efficacy of the cream gel (G-M) and the emulsion with the non natural benchmark (E3-M) *(figure 4)*.
- Significant improvement at one time of the emulsions with glucolipid emulsifiers compared to the gel: eight hours for the C16-C18 fatty chain based (E1-M) and 24 Hours for the C14-C22 fatty chain based E2-M).

Figure 3 – Comparison of emulsion vehicle influence

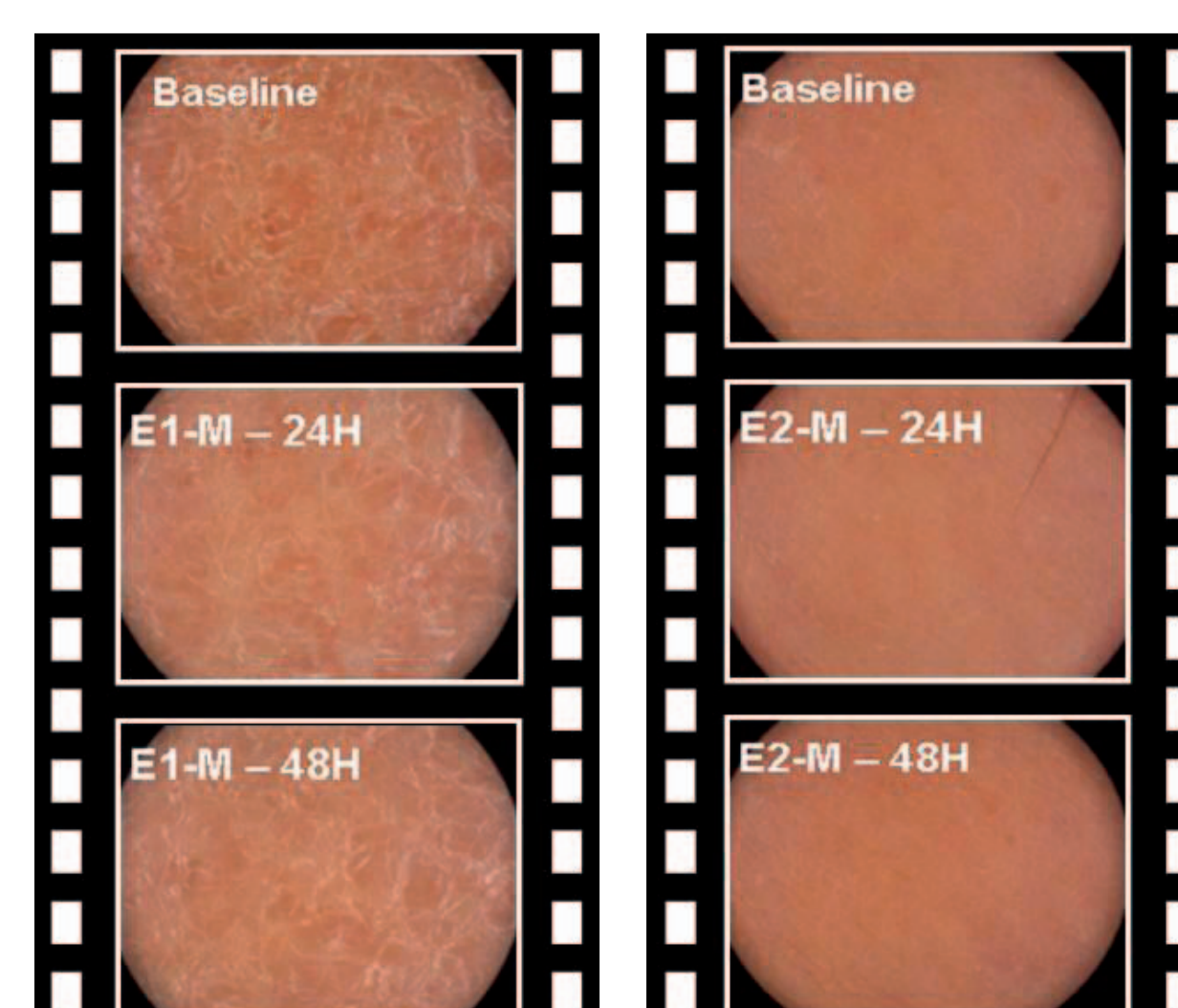
Figure 4 – Comparison of emulsions and gel

► Dermatoscopy

- Significant reduction of squames compared to the initial skin state, up to 24 Hours after application, for all the formulations *(scoring in table 2)*; demonstrating well the interest of the "non-active" ingredients to quickly obtain visible benefits [3].
- Still significant squame reduction after two days for three of the four formulas containing the moisturizing active (G-M, E1-M, E2-M), whereas the corresponding controls had no further effect *(see examples of images with E1-M and E2-M in figure 5)*.

FORMULA REFERENCE ↓	Mean reduction of skin dryness versus Baseline (%)			
	3h	8h	24h	48h
G-M	-27*	-32*	-27*	**-11***
E1-C	-51*	-43*	-13*	-1
E1-M	-52*	-42*	-37*	**-16***
E2-C	-54*	-43*	-21*	-5
E2-M	-64*	-43*	-29*	**-8***
E3-C	-34*	-38*	-22*	-12*
E3-M	-21*	-26*	-23*	-2

* Significant (Wilcoxon signed-ranks test)

Table 2 – Dermatoscopic image scoring

Figure 5 – Dermatoscopic images

Références

1- Lane, M.E. et al. Rational formulation design. International Journal of Cosmetic Science, 2012, 34, pp. 496-501.

2- Wiechers, J.W.. The EEE concept: How emollients and emulsifiers work together to create more efficacious cosmetic products. 2011, New York SCC.

3- Dederen, J.C., Chavan, B. and Rawlings, A.V. Emollients are more than sensory ingredients: the case of Isostearyl Isostearate. International Journal of Cosmetic Science, 2012, 34, pp. 502-510.

CONCLUSION

In addition to the biological knowledge and understanding of the mode of action, such in use conditions studies provide simple and essential information for the formulator. The results demonstrate the versatile moisturizing effect of the sugar-based active in emulsions as well as in a gel. However, the emulsifier structure seems to influence the moisturizing kinetics of the active ingredient: the glucolipid based on the C14-C22 fatty chain provided the more prolonged moisturizing effect.

Perspective:

Investigation of the moisturizing effect over a longer evaluation period, after repeated applications and using more innovative and precise investigation techniques such as Raman spectroscopy.