To find the missing link between clinical study and sensory test result

CM-SS-568

KANG Dongfang[1]; LI Jiantong[1]; LI Na[1]; SHEN Jiayi[1]; LU Nan[1*]

[1] Research department, Shanghai Pechoin Daily Chemical CO., Ltd, Shanghai, China

* LU Nan, NO.12 Fengpu Road, Shanghai, China, +86 13816566751, lun@pechoin.com

Introduction:

Along with the "Standards for the Evaluation of Cosmetic Efficacy Claims" released by the National Medical Products Administration of China (NMPA) in 2021 (No. 50 in 2021), NMPA requires that the cosmetic efficacy claims should be evaluated by clinical test, or consumer test or other in-vitro test, or by references literature. Regulations and public's criterion have pushed the pursuit of cosmetic efficiency to a new level. Cosmetics as a fast-moving consumer goods, has its own particularity. The efficacy and sensory feeling that meet the needs of consumers are the key to the extension of its life cycle.

With the maturity of the market, the intense market competition, and the promotion of consumers' awareness, cosmetics manufacturers confirm the efficacy of their products to consumers in various ways, such as the demonstration of small laboratory experiments (DEMO), the research data of in-vivo or in-vitro test, and the sensory feelings of target consumers, etc.[1-5] These different dimensional detection methods are correlated with each other, but also have some deviation, especially between clinical results and consumer sensory data. We confirm the efficacy differences via clinical results, but whether these differences can be recognized by consumers needs to be identified by consumers' sensory experience. The main purpose of this study is to explore the perceptibility between the difference of single efficacy index.

The hydration is the basic function of cosmetics. Consumers' demand insight shows that the moisturizing is the first demand for people to apply cosmetics no matter what age and skin types.At the same time, oil in the formulation provide the nourishment feeling to the consumer. Nourishment is also an important sensation index that consumers pay close attention to, especially for specific seasons, skin types or specific ages. For example, young people in summer will choose fresh and non-greasy products, while in winter, they will select skin care products with different nourishment degrees according to their skin types.

How consumers feel during application and after use is one of the important factors that affect their first choice of products and become repeat customers. It is of great significance to study the relationship between the sensory, clinical test and formula of consumers in these two processes, and to measure the sensory feeling of consumers with objective data, so as to provide the basis for products development.

In this paper, the moisturizing and nourishing effects of skin care products are taken as the starting point, and the clinical hydration test and the consumer moisturizing sensory test was correlated, as well as the relationship of the water or oil content and the consumer nourishment feeling are taken as the research indicators, trying to correlate the relationship among consumer sensory, clinical efficacy and the formula through the data results.

Materials & Methods:

Clinical test:
Thirty healthy female volunteers aged between 25 to 45 years with the hydration content of volar forearms below 30 measured by the Corneometer were recruited，All measurements were performed in a climate controlled room (temperature 21±1℃, relative humidity 50 ± 5%) ，The skin hydration parameters were collected by Corneometer CM825 (Courage & Khaza-ka Electronic GmbH, Cologne, Germany) immediately and after application 1-hour.

Sensory test:
Semi-quantitative team: Recruited and trained 30 testers who's sensory were sensitive identified by difference test, all the testers has common understand about the skin hydration and skin nourishment. And all the testers volunteered to take the test. The sensory data were collected via questioners . After application of different samples on the volar forearms, the hydration feeling and nourishment feeling were ranked respectively when the sample was completely absorbed and after 1 hour of use.

Data Statistics
The baseline data of volar forearm hydration obtained by Corneometer was tested by normal distribution.
Use the following formula to calculate the hydration difference of the sample at the test timepoint.
D-value@test timepoint per subject= Test value@test timepoint per subject -Test value@baseline timepoint per subject.
D-value average =Sum D-value@test timepoint per subject/Number
The D-value average of skin hydration was tested by analysis of variance between several samples. The significant difference of sorting data was tested via Least-Significant difference (LSD) formula.
LSD=$1.96 \times \sqrt{(M \times (N+1))}/6 \approx 20$, (M=tester number N=sample number, a-error=95%) [7]

Test sample
Four creams with different formulations were prepared : O/W cream 1(sample A)，O/W cream 2 (sample D)，W/Si-O quick break cream (sample E), W/Si-O cream(sample G).

Aknowledgments:

Results & Discussion:

In-vivo test
For skin hydration, after single application of different samples, the water contents were collected by Corneometer CM825 immediately and in an hour point. The average of hydration increase was shown in fig.1.

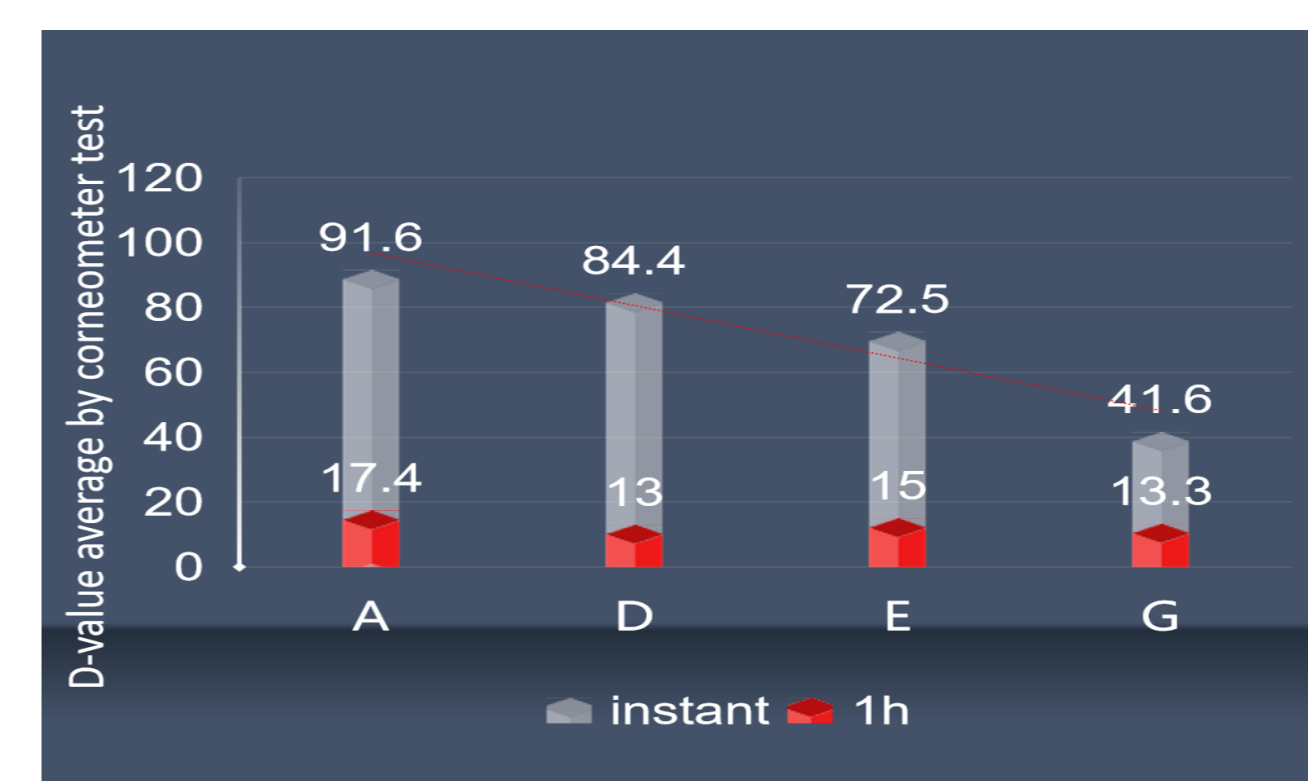FIG.1. HYDRATION D-VALUE AVERAGE OF 4 TEST SAMPLES

later, there was no significant difference between the samples because all the rank sum difference is below 20.

TABLE 3.RANK AND RANK SUM ABOUT NOURISHMENT AT INSTANT

Sample	Sequence				Rank Sum
	1	2	3	4	
G	14	12	3	1	51
D	12	16	0	3	56
A	2	2	16	10	94
E	2	0	11	16	99
Sum	30	30	30	30	300

TABLE 6. RANK AND RANK SUM ABOUT NOURISHMENT AT 1H

Sample	Sequence				Rank Sum
	1	2	3	4	
D	15	7	3	5	58
G	10	7	9	4	67
A	3	8	10	9	85
E	2	8	8	12	90
Sum	30	30	30	30	300

TABLE 1. RANK AND RANK SUM ABOUT MOISTURE AT INSTANT

Sample	Sequence				Rank Sum
	1	2	3	4	
D	18	10	0	2	46
A	11	17	0	2	53
E	0	2	26	2	90
G	1	1	4	24	111
Sum	30	30	30	30	300

TABLE 2. RANK AND RANK SUM ABOUT MOISTURE AT 1H

Sample	Sequence				Rank Sum
	1	2	3	4	
D	8	12	3	7	69
A	9	9	9	3	66
E	7	3	10	10	83
G	6	6	8	10	82
Sum	30	30	30	30	300

for the sensory test result were shown in table1 and table 2, after apply the samples to the arm and immediately evaluate the moisture ,the tester test result is that the sample D and A have equal higher moisture function, the sample E has medial moisture function, the sample G has lowest moisture function. After 1 hour

As shown in table 3 and table 4,the Nourishment feeling in the instant point, the sample G and D have equal higher nourishment function, the sample A and E have equal lower nourishment function. At the 1 hour point,
the sample D and G have equal higher nourishment function, the sample G and A has medial nourishment function, the sample A and E has lowest nourishment function.

Comparing the results of clinical data and sensory results, it is found that the increase of hydration value in clinical data is more than 10, which is easy to be perceived by consumers. If it is lower than this value, consumers will not be aware of it. In terms of nourishment attribution, consumers' perception will not change with the extension of sample application time, which is a relatively stable feeling.

Conclusions:

Hydration: From the present study, water content of the formula is the biggest influence factor on the in-vivo hydration test. In this study, formulas with different water contents were designed and tested. To assess the difference between different formulation type, O/W cream 2 and W/Si-O cream with the same water content were designed and applied. Even with the same water content in the formula, O/W cream (Sample D) had the better immediate improvement effect than W/Si-O quick break cream (Sample E), but there was no significant difference after one hour. This may be due to the fact that the water of O / W cream is easier to contact with the skin and be absorbed directly by the skin during application, thus increasing the hydration value. While the W / Si-O cream were applied, the silicone oil or oil spread on the skin to form an oil film, which hinders the absorption of water. However, as the water evaporated gradually over time, there was no significant difference in the effect of the four formulations on hydration at 1 hour. Compared the hydration of O/W cream 2 and W/Si-O quick creak cream, even if a large of amount of polyols is added to the W/Si-O quick break cream to ensure the stability, it has no obvious improvement in the immediate and 1-hour hydration, indicating that the polyols do not have a particularly advantage in the hydration effect. This suggests that when we developing moisturizing products, only changing the content of water and polyols (such as PROPYLENE GLYCOL) was not enough, the formulation types were also an important factor. According to the result of O/W cream 1 (Sample A), the polymer moisturizers are conducive to long-term hydration effect.

Sensory: For the same formula type of products, the difference of water content is less than 10%(w/w), which is not easy for consumer to perceive. But for different formula types of products with different water content, consumer can obviously perceive the difference in sensory, especially in water sensation. Consumers' perception of water is more related to the formulation types. Both immediately and after 1-hour, consumers rated the O/W formulation as more moisturizing than W/Si-O quick break formulation with the same water content. When O/W products are applied, a large amount of water contacts with the skin, it is difficult for consumers to perceive small difference in moisturizing sensory. However, when W/Si-O products were applied, oil or silicone oil directly contacts with the skin and spreads on the skin to form an oily film, which bringing different sensory effects to consumers. This was verified by paired comparison experiment and the immediate comparison of rank sum of moisturizing sensory. With the prolongation of the experiment, water evaporated, left oil, waxy or solids on the skin, the influence of water content of formulation was weakened, while the influence of the oil increased. As for the perception of nourishment sense, there was no difference between immediate and 1-hour, indicating that nourishment sense has no obvious relationship with time. The recognition of nourishment sense was more related to the formulation type and the overall oil content in the formulation. And for same formulation type, consumer can clearly perceive the difference of about 10%(w/w) oil content.

References:

[1] Lee, E. , An, S. , Choi, D. , Moon, S. , & Chang, I. . (2010). Comparison of objective and sensory skin irritations of several cosmetic preservatives. Contact Dermatitis, 56(3), 131-136
[2] Ni Sb Et, S. , Mahalingam, H. , Gfeller, C. F. , Biggs, E. , Lucas, S. , & Thompson, M. , et al. (2018). Cosmetic benefit of a biomimetic lamellar cream formulation on barrier function or the appearance of fine lines and wrinkles in randomised proof. f∖concept clinical studies. International Journal of Cosmetic ence, 41.1–11
[3] Zasada, M. , Debowska, R. , Pasikowska, M. , & Budzisz, E. . (2016). The assessment of the effect of a cosmetic product brightening the skin of people with discolorations of different etiology. Journal of Cosmetic Dermatology，0, 1- 10
[4] Pereira, A. , Igarashi, M. H. , Mercuri, M. , Pereira, A. F. , & Eberlin, S. . (2020). Whitening effects of cosmetic formulation in the vascular component of skin pigmentation. Journal of Cosmetic Dermatology, 19(6).00:1–7.
[5] Musnier, C. , Piquemal, P. , Beau, P. , & Pittet, J. C. . (2010). Visual evaluation in vivo of 'complexion radiance' using the c.l.b.t. sensory methodology. Skin Research & Technology, 10(1), 50-56.
[6] Bazin, R. , & Fanchon, C. . (2006). Equivalence of face and volar forearm for the testing of moisturizing and firming effect of cosmetics in hydration and biomechanical studies. Blackwell Publishing Ltd, 28(6), 453-461.
[7] Lawless, H. T. , & Heymann, H. . (2010). Sensory Evaluation of Food: Principles and Practices,696