

Cracked heels are a common foot problem often referred to as heel fissure (Figure 1). Currently, there is no known method to evaluate the performance of anti-cracked heel products. However, a new anti-cracked heel efficacy test allows products to be evaluated for their performance.

With the emergence of skin bioengineering instruments, the hydration and roughness of the skin can be measured. The data, together with image analysis, enable quantitative analysis of cracked heels, and, thus, evaluation of the anti-cracked heel products.

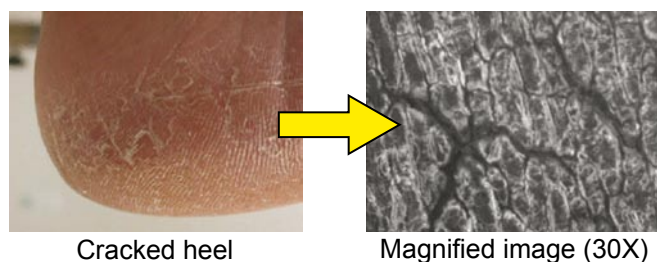


Figure 1.

EFFICACY EVALUATION

Cutaneous changes can be quantified and monitored non-invasively by bioengineering tools. Skin elasticity, hydration and surface measurements show changes reflecting the damage to the cutaneous structures. Impairment and degeneration of the *stratum corneum* causes it to lose water and dry out. Morphological changes to the skin, such as increased roughness and cracking, then results, which can be measured using skin bioengineering instruments.

Skin Hydration

Cracked heels are known to result from excessively dry skin (xerosis) due to uneven cohesion of the corneocytes. This allows faster loss of water

through the skin, resulting in a drier surface. The hydration of the skin can be measured through the resistance of water to electrical conductivity, or its capacitance. The capacitance is measured under the skin by a Corneometer. With the *stratum corneum* hydrated, there is an increase in the dielectric value. Water has a high dielectric constant of 81 and other substances much less (~7 units). The capacitance is then converted to arbitrary units (a.u) of skin hydration.

Figure 2 shows the effects of applying an anti-cracked heel cream in hydrating the skin for up to four weeks. After one week, the skin hydration had significantly increased and it was maintained thereafter to the end of the four weeks' treatment. The control skin was significantly drier.

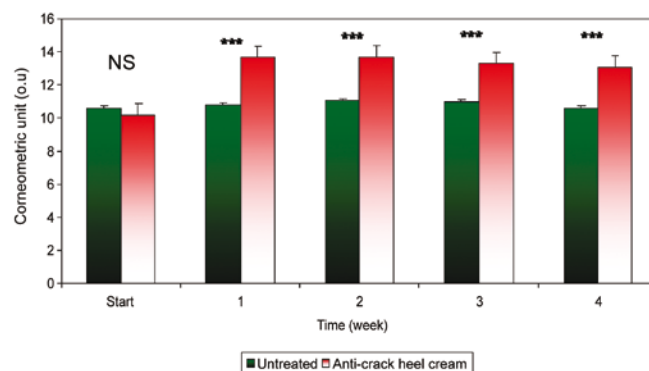


Figure 2. Skin hydration effect of applying anti-cracked heel cream on skin for up to four weeks of treatment.

Note: NS – not significant; *** Significant (P < 0.001).

Skin Roughness

The surface roughness of a skin is one of the main indicators of its health. It changes with other skin changes - keratinization disturbances, environmental and job-related skin irritations, infectious skin diseases and age-related defects. It is known that cracked heels result from dry skin, with fissures developing in severe cases. The condition can be monitored with a Skin Visiometer which evaluates the skin surface roughness (Rz)

as defined by mechanical profilometric methods (DIN 4762-4768).

Figure 3 shows the effects of applying an anti-cracked heel cream for up to four weeks in reducing the skin roughness. From the starting figure, the roughness was reduced by 20% after one week compared to less than 5% in the control. The reduction stayed constant thereafter.

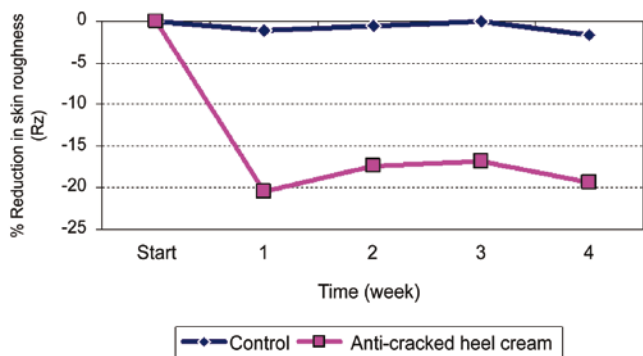


Figure 3. Effect of applying anti-cracked heel cream in reducing skin roughness.

Image Analysis

Skin images allow the cracked heels and fissures to be directly evaluated. A Visioscan – a high resolution UV-A light video camera – is used to directly monitor the skin surface.

Figure 4 shows the control skin at 0, 1, 2 and 4 weeks of the test, and Figure 5 the treated skin for the same times.

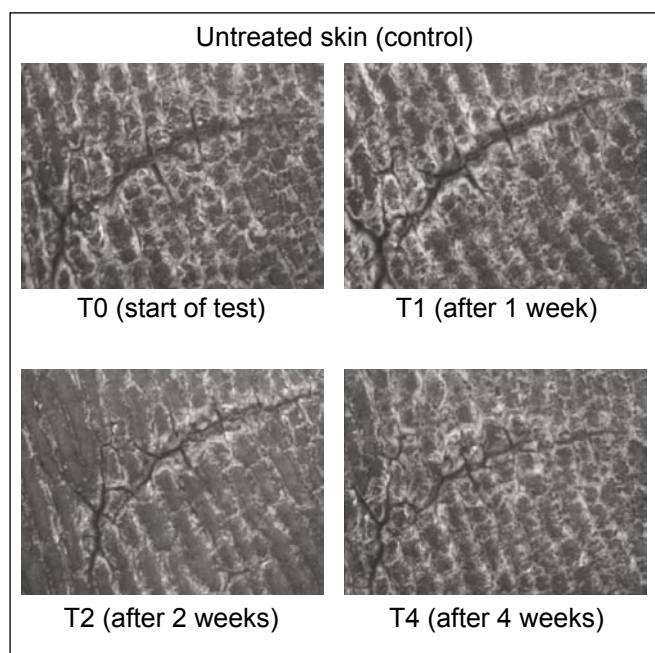


Figure 4. Skin (control) at 0, 1, 2 and 4 weeks (magnification: 30X).

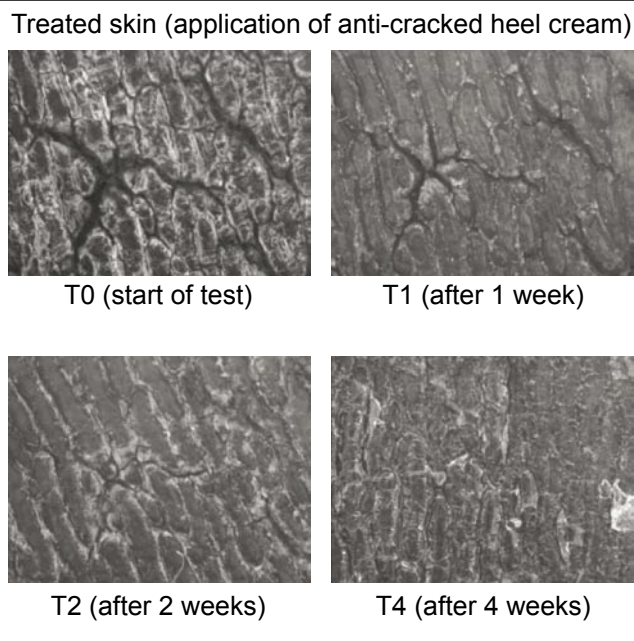


Figure 5. Skin (treated) at 0, 1, 2 and 4 weeks (magnification: 30X).

COST OF ANALYSIS

The cost of the test is as follows:

Sample	Test parameters	Duration	Cost per test
Min 200 g per subject	Cracked heels measured for skin hydration and roughness, and image analysis	1 month	RM 6500
20 subjects			

CONCLUSION

Anti-cracked heel products can be quantitatively evaluated using the latest skin bioengineering instruments - Corneometer and Visioscan – to measure the skin hydration and roughness.

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