

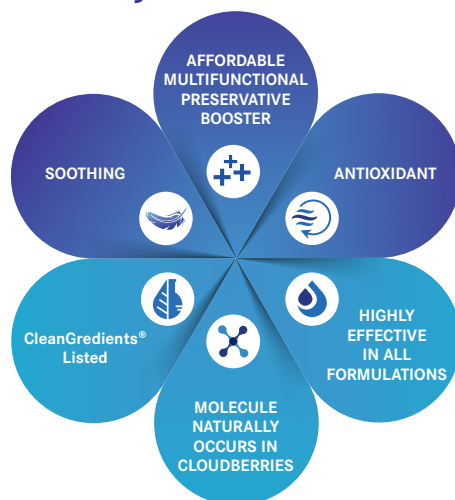
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*Innovations for Skin & Hair Care  
in a Multicultural Market*

Editor:  
Robert Fischer

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# Lichen, Moss and Ferns – Untapped Source of Effective Foot and Skin Care Actives

Stefan Bänziger, Stefan Hettwer, Brigit Suter, Barbara Obermayer

## Abstract

Lichens, mosses and ferns have previously received little attention in cosmetics. Because they do not have flowers, these original plants do not easily capture the imagination of the general public. However, these woodland plants have exceptional natural properties and a mental association with moisture and freshness. This makes them interesting base materials, whether for anti-ageing and moisturising care in general, or for foot care in particular.

The anti-ageing moisturiser HYDRACTIN®-LMF combines the extract of the *Cetraria lichen* (Icelandic moss), *Sphagnum moss* (peat moss) and the *Polypodium fern* (Polypody). By providing the skin with adequate moisture, the active ingredient turns the epidermal clock back by approximately 20 years in just 4 weeks. This article focuses on foot care properties: stressed, calloused and cracked feet become noticeably and visibly softer and more supple.

## Moisture: a simple but all the more important anti-ageing strategy

The many sophisticated cosmetic actives developed in recent years, such as peptides or

stem cell protectants, all focused on combating wrinkles and preventing skin ageing. The natural elixir of water and the simple mechanism of skin hydration have been largely forgotten. Moisture may sound mundane, but it is a very important and probably underestimated anti-ageing strategy [1].

Dry skin is more prone to premature ageing and reduced turgor, resulting in reduced elasticity and firmness in ageing skin. In other words, dry skin is an ideal breeding ground for changes in skin physiology. [2]. Thus, the skin loses its elasticity, leading to the development of lines and wrinkles. Regardless of how many active ingredients are applied that have an immediate effect against the signs of ageing, moisture content is crucial and keeps the skin fresh and young.

Against this backdrop, it becomes obvious that intelligent moisturisers not only solve the problem of dry skin, but also improve the elasticity, firmness and unevenness of the skin and prevent the formation of wrinkles. [1]. Moisturisers should both provide the skin with additional moisture and store and preserve this as long as possible. The anti-ageing moisturiser presented here—HYDRACTIN®-LMF—has precisely this dual function and is both moisturising and moisture-preserving.



**Fig. 1** Forests – a source of inspiration. Forests represent places of dreams, undisturbed nature and healthy vitality. They are powerful and original, quiet, yet loud.

## Symbiotic combination of three woodland plants

The development of the cosmetic active HYDRACTIN®-LMF was inspired by the symbolism of the forest, because the forest is a symbol of freshness and vitality (**Fig. 1**).

The suffix **LMF** stands for an effective combination of extracts of Lichen, Moss and Fern. Lichens, mosses and ferns previously received little attention in cosmetics. This may be because they often appear unattractive to the general public on account of their lack of flowers. Lichens, mosses and ferns belong to the so-called cryptogams—plants that “reproduce in secret” [Greek *kryptós*: hidden, concealed; *gamós*: wedding], that is, without flowers. They are the opposite of “visibly reproductive” flowering plants. But the biology of these plants reveals valuable and unique details:

**Lichen** (*Cetraria islandica* or Iceland moss) provides moisture: substances such as poly-

saccharides, especially lichenan and isolichenan, form a moisturising physical film that rehydrates the skin’s surface. Iceland moss is known as an agent that can alleviate tickly coughs by forming a moisturising film [3-5].

**Moss** (*Sphagnum magellanicum* or peat moss) binds water: water-loving moss is unrivalled in the storage of water. It is known for its water absorption capacity—up to 20-30 times its own weight. [6] Moss is therefore associated with moisture, freshness and recovery. Consumers experience these associations when they use the extract in their daily skin care routine (**Fig. 2**).

**Fern** (*Polypodium vulgare* or polypody) supports and complements: substances such as saponins support lichen in the formation of a moisturising film [7]. Active ingredients such as polypodines have adaptogenic and anabolic effects [8]. They are thought to improve the skin’s resistance to stress and its metabolism, thereby counteracting skin ageing. Polypodines are known to increase pro-





**Fig. 2** Moss – aesthetic, appealing and beneficial. Moss produces positive emotions such as relaxation from everyday life. It is a wonderful experience for body and soul to run across a soft carpet of moss or unwind in a damp, mossy, tranquil forest. An ideal starting point for a spa or foot care concept.

tein synthesis [9]. In our opinion, this leads to an increased NMF content (NMF = Natural Moisturising Factor) and ultimately improves the skin’s capacity for water retention and binding.

### Younger through moisture

The production of HYDRACTIN®-LMF extracts all three plants in a process step. The extract provides the skin with sufficient moisture and turns back the skin’s biological clock: after two weeks, the skin will be about 10 years younger. After four weeks, the skin’s youthfulness even improves by 20 years. These data have been presented elsewhere [1]; here we will set out the advantages of the extract for foot care.

### Highly effective foot care

Feet are one of the hardest working parts of the body – and the last to receive any attention. However, well-groomed feet can contribute significantly to the overall sense of well-being. In this experiment, we aimed to

show that the application of HYDRACTIN®-LMF makes feet look and feel attractive and healthy.

Foot care efficacy was evaluated by objective assessment by dermatologists, by subjective evaluation using questionnaires and subject diaries, and by ultrasound measurements as outlined in **Tables 1** and **2**.

#### 1. Feet look well cared for

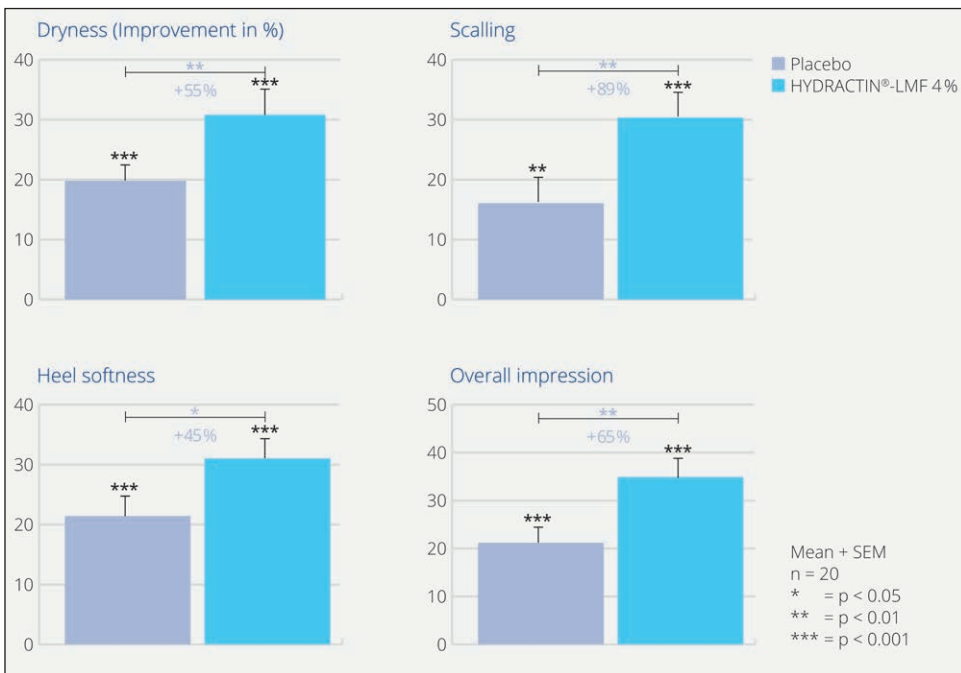
Objective assessment by a dermatologist at the beginning and end of the trial (visually and by touching the subject’s skin). After 14 days of treatment, skin dryness, scaling, heel softness and overall impression had improved by 30-35 %. HYDRACTIN®-LMF was statistically significantly better than pla-

**Table 1** Experimental Setup.

<b>Test design</b>	Double-blind, placebo-controlled, randomised
<b>Test subjects</b>	20 subjects (2 male, 18 female), all with healthy Caucasian skin; 30-62 years (average 48.2)
<b>Test formulations</b>	Emulsion containing 0 % HYDRACTIN®-LMF (placebo) Emulsion containing 4 % HYDRACTIN®-LMF
<b>Application area</b>	Feet
<b>Application period</b>	2 weeks
<b>Application frequency</b>	Once daily; last application the evening before measurement

**Table 2** Test Formulation

St	Substance	INCI name USA	% [w/w]	Manufacturer
1	Water demin.	Water	Add 100	several
2	Tego Carbomer 340 FD	Carbomer	0.30	Evonik Industries AG, DE
	Keltrol CG-SFT	Xanthan Gum	0.20	CP Kelco, US
3	Verstabil PC	Phenoxyethanol, Caprylyl Glycol	1.00	Dr. Straetmans, DE
4	NaOH solution 4 %	Sodium Hydroxide, Water	0.90	several
5	HYDRACTIN® -LMF	Propanediol, Water, Polypodium, Vulgare Rhizome Extract, Cetraria Islandica (Iceland Moss), Thallus Extract, Sphagnum Magellanicum Extract, Citric Acid	0.00 or 2.00	RAHN AG, CH



**Fig. 3** HYDRACTIN®-LMF effectively cares for feet. Visible and perceptible skin parameters such as dryness, scaling, heel softness and overall impression were objectively assessed over time on a scale of 0 to 100 by a dermatologist. The percentage improvement for each parameter is shown. Upper left: Within just 2 weeks, the application of 4% HYDRACTIN®-LMF improved skin dryness by 31% relative to baseline. This improvement was 55% greater than the improvement with placebo. Other panels: there were also impressive improvements in the degree of scaling (30% vs baseline and 89% vs placebo), heel softness (31% vs baseline and 45% vs placebo) and overall impression (35% vs baseline and 65% vs placebo). The statistical values shown in violet relate to the comparison of HYDRACTIN®-LMF with placebo, whereas the values in black relate to the comparison of the respective treatment with the initial condition. Two-tailed, paired t-test.



**Fig. 4** Healthy and attractive feet. The application of an emulsion with 4% active ingredient over two weeks led to visible improvements. The figure shows two illustrative examples.

cebo, i.e. by 45-89%. Based on these data, we conclude that HYDRACTIN®-LMF makes feet look and feel more attractive and healthy (**figure 3** and **4**).

## 2. For a better foot feeling

Subjective assessment was conducted by means of a questionnaire and a subject diary: the test subjects used a questionnaire to evaluate skin feeling after treatment. In addition, each day, subjects documented the severity of symptoms such as horny skin, dryness, roughness, chapping, sweaty odour and burning.

After 14 days of treatment, test subjects reported that skin discomfort was reduced by approximately 40%, and their feet felt soft, smooth, and moisturised. In conclusion, HYDRACTIN®-LMF can provide solutions for problem feet with hard, horny, rough and dry skin (**figure 5** and **6**).

## 3. Areas of hardened skin are reduced.

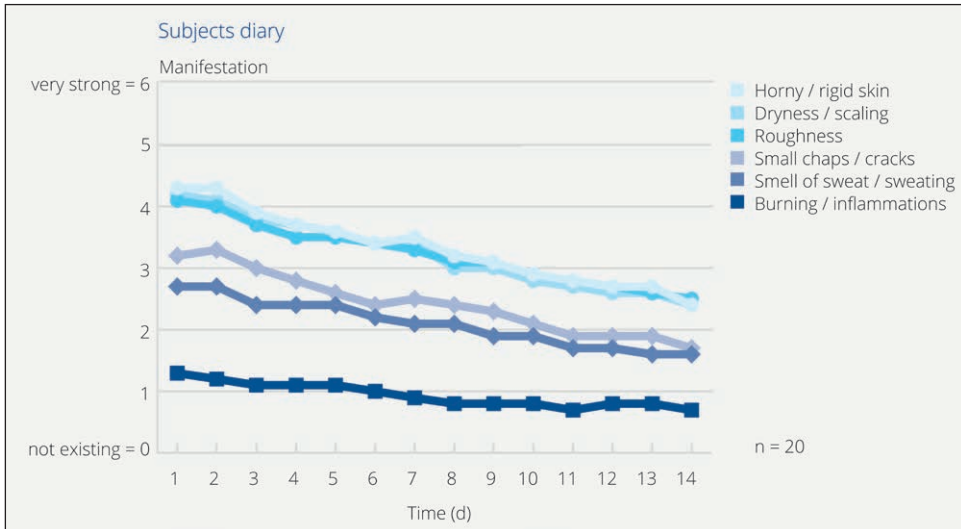
In a subpopulation ( $n = 5$ ), 20 MHz ultrasound measurements were taken to measure the influence on callus thickness, i.e., the thickness of the area of hardened, yellowish skin around the heels. Calluses usually form in response to repeated pressure and friction: by accumulating terminally differentiated keratinocytes, the skin attempts to protect itself against injury. Calluses are generally not harmful, but are unattractive and may sometimes cause pain, in particular when wearing high heels.

The application of 4% HYDRACTIN®-LMF for two weeks led to an average reduction of callus thickness of 64  $\mu\text{m}$ , or 20.2% (**Fig. 7**).

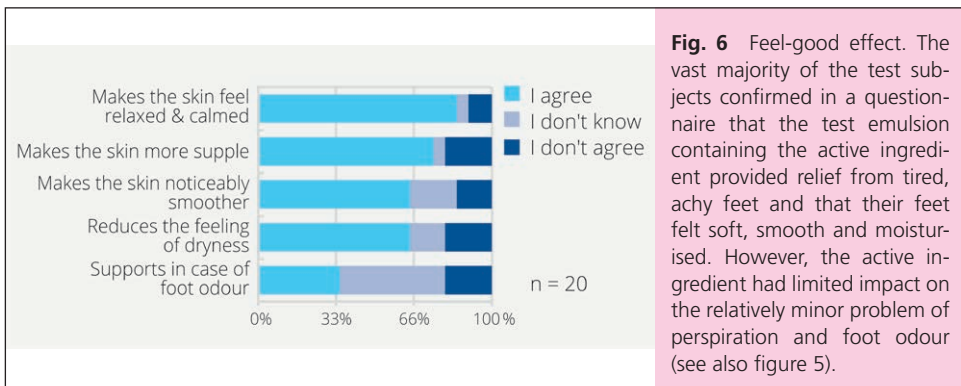
## Conclusion

The way in which forests manage their moisture to sustain their longevity served as the model for the development of the cosmetic active HYDRACTIN®-LMF. Lichen, moss and fern, three unique woodland plants, are perfectionists in processing moisture. When applied to the skin, they can also improve its moisture management.

## Antiageing



**Fig. 5** Remedy for problem feet. The test subjects documented changes in the condition of their skin in a daily diary. Very strong symptoms were rated 6, whereas symptoms that did not occur were rated 0. Symptoms such as horny, dry and rough skin were the main problems, whereas burning and sweating seemed to be relatively minor. After application of the active ingredient, all symptoms improved by 39-47 % within 14 days.



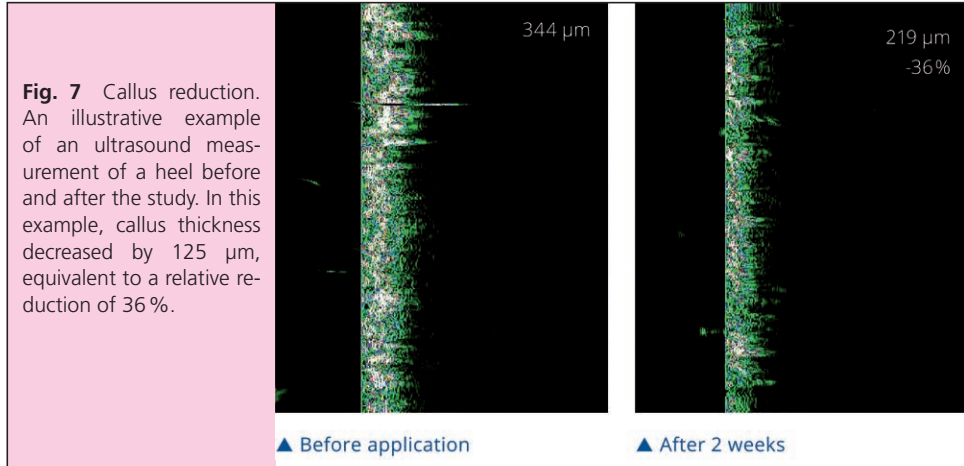
**Fig. 6** Feel-good effect. The vast majority of the test subjects confirmed in a questionnaire that the test emulsion containing the active ingredient provided relief from tired, achy feet and that their feet felt soft, smooth and moisturised. However, the active ingredient had limited impact on the relatively minor problem of perspiration and foot odour (see also figure 5).

In particular, dry problem areas such as the feet can be pampered and beautified: discomfort is relieved, cracked heels are moisturised, the feet's natural softness is restored and roughness is normalised before it can result in a corn or callus. Feet that feel soft and supple can play a large role in the consumer's overall sense of physical and emotional

well-being: when the feet feel good, the person feels good too!

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### Company Profile

#### **RAHN Group – Specialising in Market-orientated Cosmetic Active Substances since 1999**

RAHN AG is a financially independent Swiss family company with three business areas, Cosmetics, EnergyCuring and Scent & Taste. RAHN AG has been a key player in the international marketplace since 1940 and has more recently grown into an internationally acclaimed expert in the development and sale of speciality chemicals. In 1999 RAHN launched its own cleverly devised RAHN-Cosmetic Actives for use in a variety of applications.

#### **RAHN-Cosmetic Actives – a Holistic Platform Satisfying Individual Customer Requirements**

We at RAHN speak the language of cosmetic science and strive to generate new inspiration for our customers. This message is reflected in RAHN-Cosmetic Actives where we recognise and harness the potential of nature, whilst combining it with modern technology to generate market-orientated, tried and tested active concepts. Constantly at the cutting edge of skin biology, we transform our scientifically proven systems into cosmetic statements. With its extensive platform, RAHN-Cosmetic Actives is capable of meeting a wide range of customer requirements be it in terms of marketing, science, product development or product safety.

#### **Uncomplicated Customer Service – Second Nature to us!**

Our customers are at the very heart of our business and we recognise the importance of responding swiftly to customer requests to offer workable solutions. The documentation for RAHN-Cosmetic Actives is comprehensive and practical. Our customers are delighted to use the intelligent trade names on their cosmetic packaging to further enhance pack claims. We are also equipped to deal with formulation problems in our technical applications laboratory as well as providing a wide range of tailor-made, state-of-the-art formulations.